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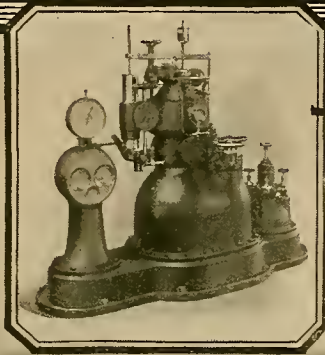
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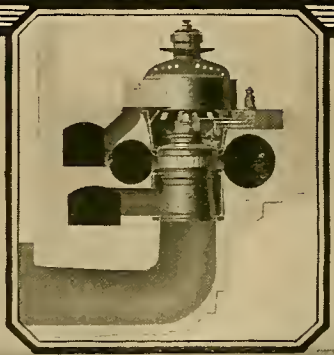
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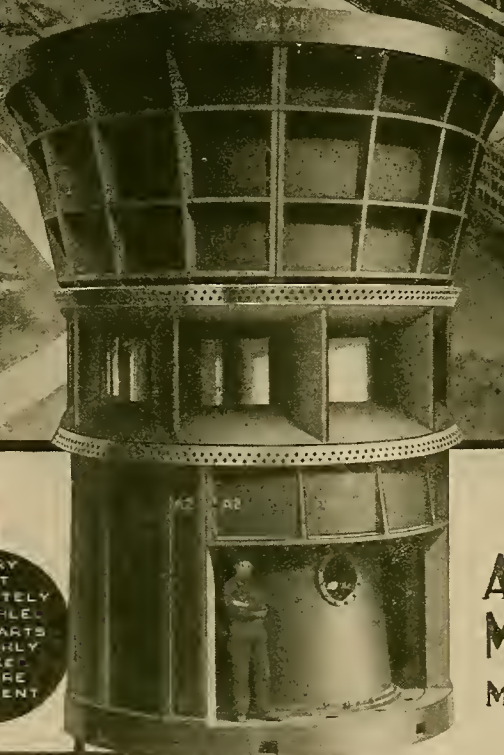
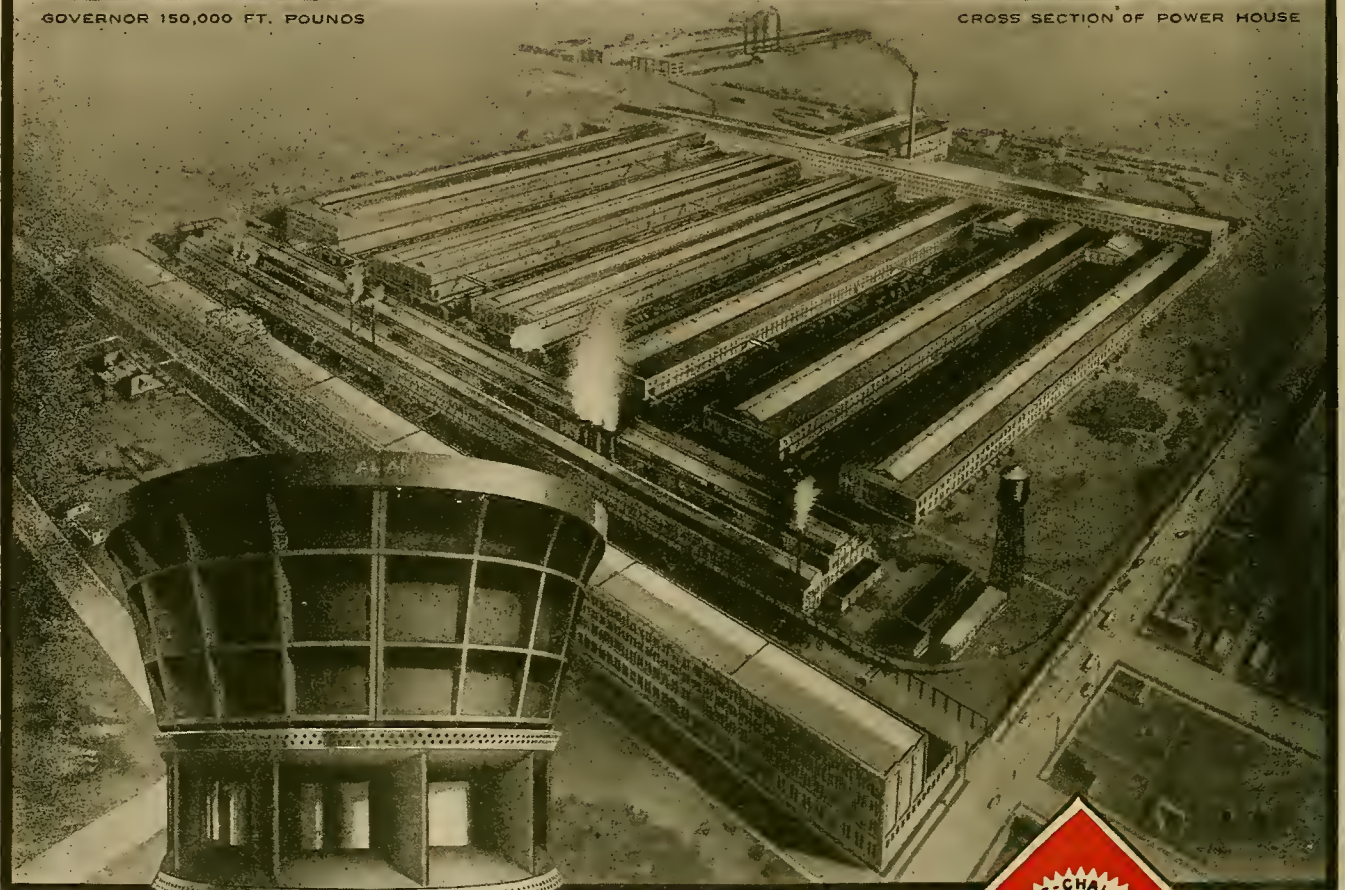


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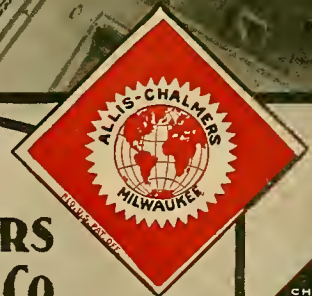


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Greetings

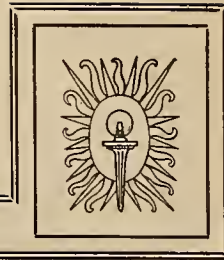
The new year dawns with hope and promise, for in the up-building of the great West a harnessing of the forces of nature and a co-ordinating of the energies of man are possible to such a degree as to render an invaluable aid in making forever secure the liberties of free peoples and the democracy of the world.

In this the thirty-first year of its service to the West, the Journal of Electricity extends greetings and best wishes to its readers and to its advertisers who have so generously made it possible for its continued service to the nation.



JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC



Volume XL

SAN FRANCISCO, JANUARY 1, 1918

Number 1

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THE POWER CRISIS —

The crisis in the power situation is today about as acute as it has ever appeared in the history of the industry. On another page of this issue an article by F. G. Baum deals with the subject of initiative and effort in war and peace.

In discussing a matter of this nature it is well to bear in mind that initiative and effort in war must perforce be on a different plane of thought than similar activity in times of peace. In view of this and taking into consideration the fact that this country is now involved in a death grapple, the outcome of which will have much to do with the future democracy of the world, we must of necessity discuss the issue from the standpoint of war service to the nation. As a consequence, while we heartily endorse Mr. Baum's views, the Journal of Electricity desires to suggest that the power companies could hasten government action by carrying still further their present policy of co-operative action among themselves and thereby instill in the public mind an even greater confidence that would lead the national authorities to authorize the Federal Reserve Banks to endorse utility notes for extensions authorized by the regulatory commissions and to issue permits for needed power developments situated on the national domain, free from all hindering and troublesome restrictions whatsoever.

That electric power is needed and needed badly is admitted on all sides. That the nation has a right to demand that every resource be husbanded and that every saving in labor, material, and finance be made, is again admitted. The first question that must be answered is as a consequence, "Are the present power companies that occupy the field husbanding labor, material and finance to a degree that warrants financial assistance from the government and that calls for the removal of restrictions for new power developments upon the public domain?"

In the main this question may be answered in the affirmative. The men themselves who have pioneered and developed the hydroelectric industry in the West are unquestionably in a class by themselves. They have harnessed waterpowers in the mountain fastnesses and brought to life industries in cities hundreds of miles distant in the face of the most trying odds. They have had the constructive imagination and the courage of their convictions to see that huge sums of money spent in building lines into barren deserts would be followed by the creation of vast productive empires in the West and as a consequence today this portion of the country is a rich agricultural section of created wealth where worthless lands existed before. And in meeting the present great national crisis in affairs of patriotic endeavor—the draft, the Red Cross,

the Y. M. C. A., the Liberty Loans—where have the great organizers been found to carry on these necessary campaigns in the West? The most casual glance at the daily newspapers will show that the master minds of the utilities of the West are the ones who are carrying the brunt of the burden for they are minds recognized as organizers and executives that do things.

However, in order that no stone may be left unturned, it is well that even a deeper search be made so that there may not exist in the minds of the public even the remote possibility of a doubt that these utilities to the very best of their ability are doing all within their power individually and collectively to conserve labor, material and finance to the utmost.

Five years of public utility regulation in the West has brought to light a truth that no one can consistently disprove—namely, that interconnection and consolidation of the physical lines and even of the operating and managerial activity of the great hydroelectric networks in many sections of the West are undisputed financial successes and that conservation in developed water power and in fuel oil is thus best attained. Why not, therefore, view this situation from its broadest aspects? Show that unselfish service is the desired goal in meeting the great world crisis now upon us. Attack the problem from the viewpoint of the demand

for great common feeders of electric energy for the industries of the West, devoid of the petty problems of selfish interest.

Under such single-minded effort as this and under leadership of executive and engineering skill that has won the admiration of the industry the world over, the good that would result is beyond estimation.

The public, fully convinced that every hydro-electric company of the West is willing and ready to court interconnection and unified development in its district under a harmonious scheme of regulated management, would instantly open its vaults for guarantees of money and favor the removal of obstructions in issuing permits on the national domain for much needed increased power supply.

On another page of this issue a suggested system of state electrical inspection is proposed. It is designed for use in California, but the conditions which it is intended to meet are common to the West. Briefly, what is needed is standardization. The central stations, manufacturers and contractors of the larger cities are compelled to live up to a searching system of inspection. This has come to be recognized as a right and proper safeguard to life and property. In the rural districts, however, where life and property are just as valuable to their possessors, often there is no inspection whatsoever, or only what is forcibly imposed by some fire insurance company. If inspection is needed for the city, it is right for the country as well—the only question is how to get it.

Obviously it is out of the question to expect the solution of these problems from small towns, unable to support an adequate inspection service, or from unincorporated districts and even if general inspection were possible, it is doubtful whether such isolated and overlapping systems would be commendable. In justice to the electric company required to live up to regulations as well as to the public served, safety rulings should be standardized. With all due recognition of the need of elasticity to meet varying conditions, there appears to be no drawback to state-wide inspection under standard supervision.

The actual framing of a measure of this sort must be given careful consideration, but there seems to be no reason why such an act could not be framed which would utilize the present effective city inspection systems or even raise these to a higher level and also bring under similar rulings the districts now uncovered. These state systems would naturally come under the supervision of the various state accident commissions which have shown their ability to handle such power to the public interest.

The value of a trade mark or slogan is of undoubted help in fixing upon the public mind a definite idea of work in view. Various schools of psychology have many times dwelt upon the fact that to startle the mind often awakens the recipient to keener desire and increased activity.

In these momentous times, however, it is well to remember that to assist the great mass of people

generally to keep the even tenor of their way is absolutely the sole method by which effective permanent results are to be accomplished.

Recent reports have it that a certain proprietor of an electric establishment in Oregon was fined \$13.95 in the Justice Court for disorderly conduct. He was charged with circulating an advertisement about the city bearing the startling inscription:

"You will die Christmas day."

The complainant declared that the placard caused his daughter-in-law to become hysterical and because of delicate condition death was the result.

The slogan, the electrical proprietor explained, was designed to mean "You will do it electrically Christmas," the "die" being an acrostic designed to startle and inform. Witnesses were on hand to testify to various serious and comic results of the advertisements, several women being in a serious nervous condition.

The police chief worked on the case all night before he found that the placards tied on the doorknobs of dwellings did not involve an I. W. W. plot.

The slogan "Do it electrically" has now become a national aid in spreading the good work of the electrical industry. The unfortunate incident cited above serves to caution all to use moderation and common-sense in any campaign for upbuilding permanent results in this period of the world's history, befraught with plottings and killings and attempts to crush out the human spark of life.

Continuity of service has long been recognized as one of the strong features of the method electrical. Only such slogans and such methods of aggrandizement as encourage calmness and imperturbability in these strenuous times should be tolerated.

In the last issue of the Journal of Electricity extended comment was made on the remarkable investigation of the Joint Committee on Inductive Interference in California. Since December, 1912, the California Railroad Commission has, through the Joint Committee on Inductive Interference, carried on an exhaustive investigation of the problem of inductive interference to communication circuits by parallel power circuits; and after five years' work the Joint Committee has now completed its final report. In order that our readers may have an idea of the magnitude of the work, the statement is made that its total cost has been over \$100,000, this expenditure having been borne jointly by the Commission and the interested power and communication utilities.

During the course of the investigation a large number of technical reports have been prepared by the Committee giving data obtained from tests and the results and conclusions both from the tests and the theoretical studies. The work has attracted widespread attention not only in the United States but also in other countries, and the Commission has had a great number of requests from engineers, utilities, and manufacturing concerns interested in this question, for all or individual copies of the technical reports.

Standardizing Inspection Service

A Word of Caution

Publication of Inductive Interference Data

The result is that the Commission is now considering the publication in book form of the most important of these reports, provided it will not be too great a monetary loss to the Commission. There is, of course, no intention to make any money out of it but, if possible, merely to pay expenses. The Commission has decided to go ahead with the publication, if a sufficient number of subscriptions can be obtained in advance to warrant the necessary outlay.

Complete details of the proposed publication are set forth in the Book Review of this issue. This splendid piece of constructive enterprise on the part of the California Railroad Commission and those who have entered with it in the joint investigation, merits the immediate and hearty response of all utility companies and others interested in the inductive interference problem.

Perhaps the most significant new aid to the furthering of industry in the United States that has come in the many campaigns for encouraging the husbanding of national resources is that of the war-savings stamps which are now being placed upon the market.

The Thrift Stamp and the Electrical Industry

Briefly put, War-Savings Stamps are the answer of a great democracy to the demand for a democratic form of government security. They are "little baby bonds." Like Liberty bonds, they have behind them the entire resources of the Government and people of the United States. They have the additional advantage that they steadily increase in value from the date of purchase until the date of maturity, and this increase is guaranteed by the Government. These stamps are issued in two denominations, the 25-cent stamp and the \$5 stamp. A net profit of 4% to the holder is guaranteed and within ten days' notice the holder may at any time realize the full cash value should an emergency arise for its use.

The electrical industry has from its inception been noted for thrift and a marked ability of creating new efficiencies and new ideas of service. In these little stamps, however, the thoughtful worker can see an ever-present incentive to bend even keener effort toward bringing these ideals into ever increasing realities.

In gazing at the beauties of the incandescent mazda lamp one can not but be impressed with the fact that should even the smallest part of the brilliant tungsten thread before one's vision give way, then the whole ceases to reflect its brilliancy. And so in the case of these little thrift stamps that are now being marketed by the national government, it is the unified carrying of the national load by every individual throughout the nation that is giving to the world a

thoughtful lesson in the spirit of democracy that will live as long as history records the deeds of men.

At the same time it is a beautiful thought that a spirit of thrift and provision for the future is being encouraged on all sides. It is well, then, that men of the industry do everything in their power to further the sale of these little caretakers of the future.

It is well in looking ahead to renewed activities for the coming year to think long and earnestly how efficiency and economic results may be the better attained. In view of the crying need on all sides for increased output at lower costs of production some suggestions are herein offered that will bear the thoughtful consideration of utility men throughout the West.

That man does not exist who can personally run all departments of a large utility business. Team work is necessary. This editorial is written, then, to remind you of the absolute importance and positive necessity of getting a little more "kick," snap and "ginger" into the organization that is working under you. The responsibility is usually vested in the manager and he in turn divides it up, giving each of you who are working under him your particular part of it, but you can bank on it that he does not give you the power of substituting some one to be responsible for the things that he is passing to you. In return for the authority you have been given you can bear in mind that your manager does not intend to allow you to "pass the buck." Each one must do his particular part of the work and be responsible in every particular way, seeing to it, under all circumstances, that the company is getting more than one hundred cents' worth of service for every dollar it pays out.

There are a hundred and one small ways for economies, and to get the best results, every one must have your personal attention and not be passed down to the man under you to do it in accordance with his ways, which may be slack and slothful ways.

The price of labor and material for operation, maintenance, and construction, has gone higher and higher, while the selling price of electrical energy is nailed down hard and fast by rates set by the regulating commission, and it is, therefore, more necessary that this class of business should get the best results possible for every dollar of outlay. To that end, let your New Year's Resolution spur you on to lend the very best that is in you, to wake up and take a new lease of life, and to set some new resolutions and a careful program of your duties, day after day and week after week, and see that there is no delay nor anything left undone that might be done, and that you foresee all the requirements for doing all of the things that are to be done.

THE NEW JOURNAL SERVICE: With this issue the Journal of Electricity initiates a new department of journalistic service by carrying in its columns a complete society directory of all meetings and coming conventions of general interest to men of the electrical industry throughout the West. To gather this accurate information and tabulate it in the condensed form in which it appears has been a considerable task, yet a task in which the editors will feel fully repaid if it adds its quota in advancing still further these instructive and helpful gatherings that are now such well established traditions in the West.

The next issue of the Journal of Electricity will be devoted with especial emphasis to the problems of the electrical contractor and dealer. Watch for the article on advertising by H. A. Lemmon, followed by a host of new ideas on window displays, helpful suggestions in a department on customers' comments and up-to-the-minute discussions on merchandising by leaders of thought in this important branch of the industry in the West.



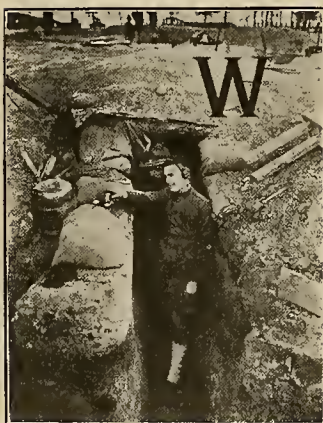
A CITY OF FIFTY THOUSAND

The population of Camp Kearney turned out to hear Billy Sunday. The supplying of these men with water and light is no small engineering feat. The picture is copyrighted by the International Film Service.

UTILITIES DEPARTMENT AT CAMP LEWIS

PASSED BY CENSOR

(The founding of a city of fifty thousand over night presents interesting problems in the lighting, water and sanitary arrangements. The Government has found it necessary to establish Utilities Departments in each of the National Army Cantonments, much like the Board of Public Works usual in our city administrations. This interesting article covers the work done under such a department in Camp Lewis, typical of our western camps. Major Hays, formerly manager of the Mt. Whitney Power & Light Company, is the Officer in Charge of Utilities at this cantonment.—The Editor.)



A TELEPHONE SYSTEM

A telephone in the camp trenches. Copyright by International Film Service.

WITH the establishment of the big cantonments, the operation and maintenance of the utilities became an important factor. In the "Old Days" the Camp Quartermaster at a post had a few handy men who could attend to the ordinary repair of the buildings, plumbing, lights, etc., very satisfactorily, but in a city of fifty thousand population it is quite a different matter. The Government therefore has established

officers and men are selected for their particular fitness for the branch of work to which they are assigned and in this connection it may be noted that the Majors in charge at each of the sixteen big cantonments are men of recognized standing in public utility circles and were selected in the majority of cases from executives of public service corporations and engineers of prominence, the object being to carry on the work on a businesslike and efficient basis. A city of fifty thousand would ordinarily have a water works, owned by one company, one and in many cases two electric power companies, sewer system, streets, fire department operated by the city, garbage often collected by private parties, several rival lumber yards, contractors and fuel dealers, many plumbing shops, carpenter shops, etc., all operating independently of one another;—in the cantonment the Utilities Department attends to these things.

a new department designated as the Utilities Department to operate, maintain and carry on any additional construction in connection with lights, heating, water supply, sewage, buildings, roads, etc. of the cantonment.

The Utilities Department is a part of the Camp Quartermaster's organization and is in the charge of a Major whose title is Officer in Charge of Utilities, and four Captains as assistants, one each acting as Superintendent of Light and Power, Superintendent of Water and Sewers, Superintendent of Buildings and Grounds and Superintendent of Fire Protection. The enlisted personnel is about two hundred men. All

Camp Lewis is a model cantonment in many respects. In the first place the ground permitted the construction of the camp in practically the exact arrangement determined upon as the ideal, namely a grouping of buildings forming a large horse shoe or semicircle, the parade and drill grounds being in the partially enclosed area, practically level with low hills on either side which are thickly wooded, giving an attractive setting from a scenic standpoint. The soil is ideal for a military camp, a coarse gravel subsoil covered with approximately one foot of loam allowing perfect drainage, for where water would collect it is only necessary to dig a pit about four feet deep to drain it into the gravel subsoil. Road building is a



A TYPICAL CAMP STREET

Not only is the camp large enough to be a city but it looks like one in some respects. Complete lighting and sanitary systems extend throughout. The picture is copyrighted by the International Film Service.

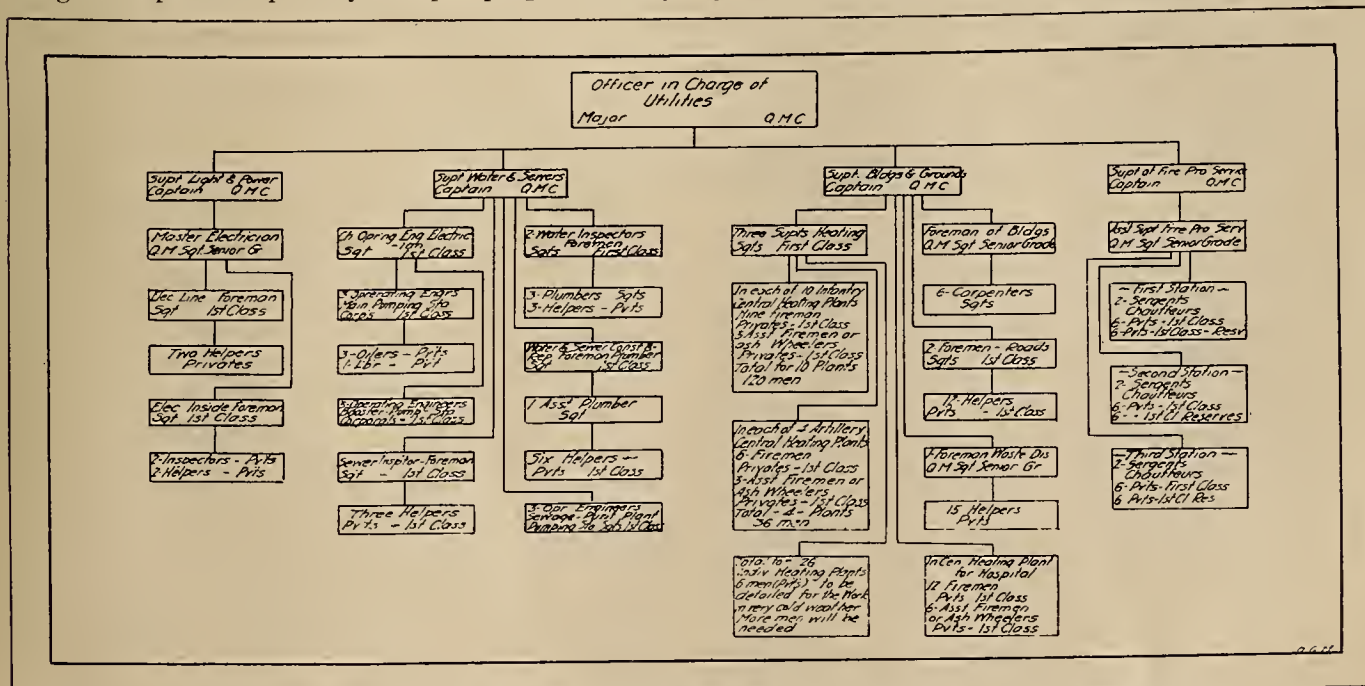
simple matter as the proportion of the gravel is sufficient to make a good road for ordinary travel when the crown of the road is sloped, drained on the sides and rolled occasionally. For heavy travel five miles of concrete asphaltum roadway is being constructed. The water supply is abundant and absolutely pure with no possibility of contamination and the slope of the ground made possible the construction of an outfall sewage system which discharges into salt water four miles from camp.

Water is supplied from wells situated about three miles from camp where electric driven pumps are installed with an auxiliary gasoline engine pumping unit. The estimated consumption of water is fifty-five gallons per man per day and pumping machinery

capable of supplying several times this amount is provided. From the pumping station the water is pumped to storage tanks situated on a hill at a height to give a pressure at the hydrants of seventy pounds maximum and fifty pounds minimum in the most remote parts of the camp at the time of the heaviest use. The trunk water mains are duplicated with frequent cross connections, and are of wood stave pipe. Plumbing fixtures are of standard manufacture of the best quality and all showers are equipped with both hot and cold water.

The sewage system serves the entire camp and is ample and substantially constructed.

The protection of the camp against fire has been given exhaustive study and fire hydrants are closely



ORGANIZATION CHART FOR THE OPERATORS OF UTILITIES AT ARMY CANTONMENTS

This does not include any of the personnel required to operate laundries, refrigerating plants or telephone service

spaced. The fire apparatus consists of six motor fire engines stationed at advantageous points throughout the grounds and the fire stations are connected by a standard fire alarm system. Auxiliary apparatus consists of hose reels located at frequent intervals and each building is provided with fire buckets, chemical fire extinguishers, etc.

Buildings are heated by steam and large stoves of special design. Individual steam heating plants similar to those commonly used by apartment houses are installed for the heating of office buildings, officers' quarters, etc. and infirmaries, while the large barracks are heated by huge stoves fitted with a sheet iron outer wall separated by an air space, the warm air passing out at the top where it is deflected by a sheet iron hood giving a very even distribution of heat over a large area. Hot water is provided by individual heaters in each lavatory. The Base Hospital is heated from a central heating plant where standard fire tube steam

boilers are installed. This is a large plant as the hospital is one of the largest in the world, having a capacity of fifteen hundred beds and covering a large area of ground, all buildings being one story in height.

Electric light and power are provided throughout the cantonment, approximately fifty thousand electric lights being installed. Power is procured from the local power company and delivered to the government substation at sixty thousand volts, where it is stepped down. Emergency connection is made with the municipal electric plant of the city of Tacoma, thereby assuring continuous service. The twenty-two hundred volt distribution lines and all interior wiring is in accordance with the best modern practice. Garbage is segregated and all swill is sold to a contractor, the balance being collected by motor trucks and hauled to the incinerator where it is burned, and where all garbage cans are scrubbed with hot water before they are returned.

INITIATIVE AND EFFORT IN PEACE AND IN WAR

BY FRANK G. BAUM

(That the exercise of individual initiative is necessary to life and progress is herein set forth by one of the most eminent engineers the country has produced in the present generation of builders. In view of the nation-wide discussion of "Why the present stoppage of hydroelectric development at a period when it is most needed," this article comes at this time with unusual emphasis. Further comment upon this timely subject will be found in the editorial pages of this issue.—The Editor.)

I am and have always been in favor of the regulation of rates and service of Public Utilities by Commissions, believing that this is necessary not only to protect the public in fair rates and service, but also to protect the utilities against "hold-up" competition. I think every fair-minded person with a knowledge of the conditions will agree, that where necessary to have a monopoly and the companies must be protected against cut-throat competition, the public must also be protected in the rates for service, and must be able to obtain reasonable service.

However, I am not in favor of certain repeated ill-advised statements of commissions (threatening the utilities with government ownership, if they do not do this or that), that tend to stop practically all development of utilities. The law says that rates shall be regulated, but it has not yet said that regulation is a failure, or if regulation is a failure, what will follow thereafter.

It is quite as much up to the commissions to make regulation a success as it is up to the utilities, and I do not think it is in the best interests of the public, that statements be made which tend to stop development and extensions of the utilities. Otherwise serious consequences must come, which will cause a loss not only to the utilities but also to the public.

For example, the serious situation resulting from the past policy of the United States in discouraging a privately owned merchant marine is largely responsible for our present lack of ships in which to transport men, munitions and supplies to France.

Also the serious situation resulting from the repeated statements of commissions, advocating government ownership of railroads is, I believe, largely responsible for the present partial break-down of the railroads, at a time when they are needed to transport men, munitions and supplies to coast ports, as well as

do the internal transportation of the country.

Similar ill-advised statements by commissions and individuals of prominence, that all public utilities such as the telephone, the telegraph, the electric light and power systems, etc., would be taken over by the government, has made it almost impossible to obtain the capital necessary for the development and extensions of the systems. The manufacturing industries require power as well as men, and to get the power, we must have capital. And capital is necessary for development in war time as well as in times of peace; but it is in times of peace that the real strength of the country must be developed and conserved in order to be ready for the strain which must come in times of war.

For some years there has been practically no railroad construction, and certainly we still have much country that requires railroads, and there are still men of the pioneer type, who like to do difficult and up-building things. If the railroads had been threatened with government ownership fifty years ago, we would not have had the wonderful development of the country which resulted largely as a result of railroad construction. Where would the wheat come from that is being shipped to the allies, if it had not been for such men as Stanford, Huntington, Hill, Harriman, etc.? The country's agitators for government ownership have killed the incentive for the work of such men. Can the country afford it? What would be the cost of copper today if it were not for D. C. Jackling and his associates? With initiative destroyed, how long would it take to make telephone communication from San Francisco to New York possible, or how long would we still wait for wireless telegraphy? What would be the capacity of the railroads today had it not been for the work of George Westinghouse?

No man of experience will venture in a field of uncertainty, and it is this feature of the commissions'

attitude which has destroyed all incentive to build new railroads, or to electrify or otherwise improve the main trunk arteries of the country, to which objection is made.

Regulation must be a failure if it stops progress, and statements made by commissions and others in authority, that threaten public ownership, must stop progress, hence the statements themselves must cause regulation to be a failure.

It requires a wonderful imagination for anyone to conceive how this country's development in the past fifty years could be improved upon. This remarkable development has resulted largely through the exercise of individual initiative and effort. The public cannot afford to suppress the incentive which creates, largely without effort on the part of the public, the means for a better civilization. And certainly no one will deny that the net result of the development in the past has been a very great advance in civilization.

I am therefore not in favor of public ownership; and I further believe that the public ownership of railroads, telegraph, telephone, electric power systems, etc. must inevitably lead us to become such an autocratic, military socialism as Germany, and God forbid that we must live in such a country. I have always been an optimist, but the present situation leaves no chance for a man to be an optimist, unless he believes in public ownership and "verboden" as the law and spirit of the land. It is not yet too late to prevent the terrible conditions which must inevitably result after the war, as a result of depression of business. For I believe that with government ownership as the goal socialism will follow and practically all progress and development must in the end inevitably stop, because individual initiative and genius will die and the public will suffer and die also, because I believe a socialistic community must in the end decay. If any one doubts this, let him go to Peru and see the socialistic descendants of the much lauded Incas. Complete socialism is death, and the exercise of individual effort and initiative is necessary to life and progress.

That the exercise of individual initiative is necessary to life and progress, and that the public cannot afford to destroy the incentive which creates the means for a better civilization, one can verify by looking back and noting how many of us can actually lay claim to having furthered the development of the railroads, the telephone, the telegraph and wireless telegraphy, the electric light and power systems, the tractor and the automobile, and the thousand and one inventions and developments which the ordinary person uses, without knowing whence or how they came. The events in Russia show the danger of socialism in time of war. We are in the most critical time in the history of the United States. Let us think where public ownership will lead us, and I believe we will conclude that we must make regulation of utilities a success.

The war has brought home to us the fact that ill-advised legislation can destroy a merchant marine, and that it requires men of a constructive type to build one. The war has also taught us, that our railroad system is the life of the nation, because it moves the crops and supplies necessary to maintain the army.

The war will also teach us that electric power is necessary to manufacture the munitions and machinery required to conduct the war, and that the tele-

phone, telegraph and wireless telegraphy are invaluable in the conduct of the war. The war may clear our vision in many other ways.

There is reason, therefore, for some hope, if not for optimism, that the past talk of government ownership will cease, and in its stead there will be made an effort by the officials of the United States and the States to make regulation of the utilities a success, so that we may all with enthusiasm face the future with a constructive program to make up for the lack of constructive work in the past twenty years. If this is done, there will result the most healthy and prosperous times in the history of the United States after the war. For there is much that has been left undone in the past twenty years.

If the President will sound the warning, the governors of the various states co-operate, and the Interstate Commerce Commission and the various State Commissions will strive to solve the problem of regulation in a spirit of co-operation, I believe the present depressed feeling in the country will change in a very short time.

The big men of this country have responded to the demands of the war in a patriotic way, but we need the initiative, energy and constructive ability of these men in times of peace as well as in war. I believe these men will respond to the call with all their energy and resources under proper leadership. The country and the President need the help of men who do things. It is time the talkers give way to the doers.

There is much that has been done in the past by individuals and corporations that is subject to criticism, but this has been corrected by the spirit of the times and regulatory measures. The regulating commissions have done much good but some evil has resulted, because too drastic measures have been used, with a result that not only the evil but much that is good and desirable has been stopped.

I believe proper regulation, which will allow initiative and construction to proceed at the same time, to be a happy mean between the undesirable of the past and the undesirable of the future. The patriotism of the American people is unlimited—any American will do what he believes to be his highest duty. I believe the results we want are to be gotten not by threats but by close co-operation, and by an understanding of the problems we all have to face.

ELECTRICITY ON NEW ZEALAND FARMS

Much attention has been given to the advanced uses of electricity in the farming and dairying districts of the South Island of New Zealand, in the vicinity of the Lake Coleridge Government hydroelectric plant. This section takes in the country surrounding Christchurch. Electric power is used extensively by dairymen about their barns and sheds for lighting and the operation of milking machines, creameries, etc. In one case a farmer reports that the charge per annum covering all of these uses was only \$87.60 for a herd of 60 cows.

The government now has under consideration a big project for a hydroelectric station in the North Island. It is expected that this will provide power as cheap for the use of the general public as has been furnished in the South Island.

APPLICATION OF LARGE HYDRO-ELECTRIC UNITS

BY ARNOLD PFAU

(It is a safety measure to carry your eggs in one basket rather than five, provided you spend five times as much care seeing to it that the basket is reliable. The economy and greater stability of large units in the development of hydroelectric power have led to their adoption in many projects throughout the West. The advantages of such installations are here clearly pointed out, together with the dangers in careless handling. The problems which arise in the operation of such a unit are here considered by a man who is an authority on large hydroelectric units. The author is a member of the American Society of Mechanical Engineers and consulting engineer in the hydraulic department with the Allis-Chalmers Manufacturing Company.—The Editor.)

During the past decade there has been a pronounced tendency to reduce the number of units in new hydro-electric power plants and to increase the capacity of the individual unit. Barring a few cases this tendency can be considered well justified as a result of two principal influences.

First:

Through consolidation of small or medium power concerns into one large corporation, a power and distributing system results which offers several distinct advantages.

As the number of prime mover plants is increased, in a single system the block of power produced by one prime mover becomes a smaller portion of the whole available prime power, than has been the case before. The total available revolving masses, both of the power producing, as well as of the power absorbing equipment are increased and at the same time the momentary variation of the load of the system constitutes a smaller percentage of the total available power or load than was the case with a plurality of small independent power systems.

It can be readily seen that under these new conditions the temporary failure of one of the many prime movers is relatively so small that its power can be readily replaced by letting each of the remaining prime movers pick up a portion of same, without greatly impairing the safety of operation or the quality of service rendered.

Second:

A steady and remarkable advance has been made in the art of designing and building modern hydraulic turbines. Thanks to the farsight of the management of some power concerns and of some consulting engineers, the demand for such high class apparatus prevails over that for the so-called standard-stock-trade articles. Specifications, if issued for the purchase of new equipment are of a broader character and so enable the conscientious bidder to embody the best, both in design as well as in quality of materials and workmanship. Bids received are not merely compared on a price basis but are carefully examined as to their general and particular merits and due allowances are made where one bid justly differs from others. These facts are encouraging to the manufacturers of first-class hydro-electric equipment and are bearing fruit which is of mutual value to the manufacturers as well as to the purchasers and users of hydro-electric prime movers. Designs are more conservative, careful attention is paid to the question of wear and tear, hydraulic as well as mechanical. Dangerously high velocities are avoided, both of the operating water and of the mechanical parts. Stresses of materials nearing the elastic limit or inviting crystallization due to vibration or to alternating strains are avoided. Parts subject to unavoidable hydraulic

or mechanical wear and tear are made readily renewable so that replacement can be made without involving heavy expense in material, labor, and loss of revenue due to shut downs. As many parts as possible are kept outside and safe from exposure to the flow of water and are made accessible. This also permits of automatic or convenient manual lubrication and of periodical examination by the shift attendant so that the slightest trouble may be detected and quickly remedied without causing interruption of service.

All these features prolong the life of such a unit and materially increase its revenue owing to the almost entire absence of interruption in service. The increased hydraulic and mechanical efficiencies also add greatly to the revenue output.

It is therefore only logical to reduce the number of units in large power systems and to concentrate as much power as possible into one unit in order to save in the cost of powerhouse construction, maintenance and attendance. This policy may be criticized by its opponents who claim it is dangerous to put too many eggs in one "basket." True enough, but let us not overlook the fact that nobody will place many eggs into one basket before making a careful examination of the basket itself. It is therefore equally in order here to also examine the basket—the conditions surrounding such large hydro-electric prime movers. It goes without saying that it would be mere folly to install a well designed and built, high price unit where the accessories are not of equally high grade and selection.

Without touching upon the questions of quality of the electrical end such as generators, transformers, switchboard, transmission line, etc., it is enough to concentrate in this article upon questions only closely related to the hydraulic end.

Beginning at the intake works:— Care should be taken to avoid the entrance of driftwood, sand, gravel, ice, etc. Serious interruption in the supply of water often results from inadequate provisions for handling driftwood, for flushing out the sand, for preventing the formation of ice, all of which can be avoided if use is made of proper means already successfully used under similar circumstances.

Open canals should be protected against slides of whatever nature and should be provided with traps, waste gates, overflows, etc., so that only small portions of the total length will be affected in case of local troubles.

Pipe lines should have a liberal inlet and should be sufficiently submerged so that whirls are prevented and air cannot mix with the water. Efficient means should be provided for quickly and tightly shutting off the water in an emergency. Proper ventilation should not be overlooked to prevent collapsing of the pipe if the column of water is stopped at its upper

end. Additional racks or screens should be placed in front of such penstock inlets if there is any possibility that foreign matter can get into the water on its way from the intake works. In the selection of the width of racks or screens the manufacturer of the turbine should be consulted or he should be asked to give the size of the opening or openings through which the operating water reaches the runner of the turbine or the nozzle of the wheel. If the pipe line is long or the upper end not within easy reach then additional means such as gate valves or butterfly valves should be provided near the prime mover for quickly shutting off the water. It is of utmost importance that these valves be absolutely dependable under emergency conditions. If this is not the case they not only offer no protection and defeat the very purpose for which they are installed but they also constitute a great menace to the safety of the whole plant or power system. Many serious accidents are on record where such valves failed at the very moment when the fate of the whole plant depended on them. However, if a valve is used which has stood the extreme test to which it can be subjected, it constitutes a valuable bond of safety. If an operator has been shown and knows that he can absolutely depend on same as a trustworthy resource he will be able to concentrate his presence of mind on other equipment and prevent possible destruction which might otherwise cause even greater damage to the whole system.

"It is, therefore, inadvisable to purchase such auxiliaries piecemeal. They should be furnished as a part of the whole hydraulic equipment, and responsibility for its proper function should also be assumed by one person, who alone realizes the dangers involved and the consequent responsibilities connected with same. The additional price asked for such valves over that of standard articles is an investment which so far has never failed to show up proper returns as soon as an emergency case arises."

Another item of importance in connection with the operation of large hydraulic units is the question of their proper control.

Beginning with the governor, we may state that no matter how good a turbine may be in every respect, its service may become utterly unsatisfactory if it does not deliver the demanded power within certain desired limits of speed. Aside from the quality and quantity of service, the life of the machine may be greatly reduced if the governor imposes an unnecessarily heavy duty upon the operating mechanism controlling the flow of water through the turbine. Numerous plants can be seen where the continuous working motion of the mechanism amounts to several times what it should be if the governor performed its duty correctly. The result is wasteful use of oil, excessive wear and tear, inaccurate regulation and frequent shutdowns for repairs.

The fact should be more and more appreciated as the capacity of hydro-electric units is increased, that the governor is an integral part of the turbine. Watch-maker designs should not be tolerated with governors controlling large units, as they are apt to get out of order much more quickly than substantial designs. Furthermore, it should be realized that attendants of large units are better used to rugged parts of machinery and are not inclined to make adjustments which

almost require a magnifying glass or special watch-maker's tools. They prefer to leave such things alone even at the expense of the service rendered by such a faulty mechanism.

Simplicity is another valuable factor and more than in many other cases, the law applies here that a chain is stronger the less links it is made of. Fancy adjustments should be eliminated as they only offer the danger of being misused and of producing negative results.

Large turbines require a large governor energy for the control of their gates. It is clear that the limited force produced by one man is insufficient for manual control within such time limits as are required to enable the safe control of the unit during operation. A hand operating device should therefore be provided which makes use of the available oil pressure used by the governor. Such devices, if properly provided with a relay are well adapted to assist in keeping the unit in commercial operation during emergencies. In addition to this, however, independent means should be provided to enable the closing or opening of the gates by the manual force of one man, although at a sacrifice as to the quickness of the motion.

The oil supply to the governor of a large unit is preferably not obtained from a central oil pressure system but should, if possible, be furnished from an individual oil source of duplicate capacity so as to insure absolute protection against a shutdown in case of failure of a single element. The amount of excess investment involved in furnishing duplicate pumping equipment does not permit of its omission when compared with the loss of revenue caused by a complete shutdown of the whole unit. For the same reason, as stated before, it is advisable to provide oil pumps which are as simple and as rugged as possible and it may pay to sacrifice some efficiency in exchange for absolute reliability. A few per cent of lost efficiency in the oil pumps is a negligible quantity compared with the total output of the hydraulic unit.

The prime mover for the pump should be free from any dangers of shutdowns. If electrically operated the current should not exclusively depend on that taken from the generator, because failure of same would in turn impede the safe control by the governor. If hydraulically operated the prime mover of the pump should be designed with a view to prevent any clogging of the water supply or any binding due to sand entering between the surfaces in contact.

The question of flywheel effect of the hydro-electric unit is also of vital importance. Insufficient flywheel effect will cause hunting of the governor no matter how perfect its performance may be otherwise.

Closely related with the problem of speed regulation is the characteristic of the pipe line. The longer the pipe line or the higher the velocity of the water flowing through it the more severe will be the variations of pressure due to changes in the velocity of the water. Vice versa, the slower these changes of the velocity are made the smaller will be the variations in pressure. Slow gate motion in turn causes large variations in speed, which in turn can only be modified somewhat by an increase in the flywheel effect of revolving parts. It can thus be readily seen that for a fixed length of pipe line even a liberal diameter of

pipe from the point of view of investment may still be so small as to require a very slow motion of gates or gradual change of velocity in pipe line to prevent such pressure variations as may be detrimental to the safety of the pipe or to the satisfactory operation of the governor. It may also be impossible to provide sufficient rotating masses to prevent excessive speed variations. In such cases additional auxiliary means must be provided such as pressure regulators, surge tanks or air pressure tanks.

If pressure regulators are employed it is again of prime importance that these devices be absolutely dependable because failure of action may be at such a critical moment that the whole plant is endangered. Pop valves directly connected to the pipe line are prohibitive. Numerous accidents are on record where serious damage was caused not so much due to failure of these valves to open but due to their "popping-back" and causing a secondary ram more destructive than the first one.

Pressure regulators operated by the variation of pressure in the pipe line are not as dependable, and are more complicated than pressure regulators directly actuated by the governor or gate mechanism. Whatever types used should be so built that the attendant can examine its functioning most readily. It should not be difficult for him to cause it to work while he passes by when making his usual rounds of inspection.

Finally we desire to call attention to one point which is not always given due consideration. It is the question of cleanliness and neatness in a modern plant with large units. The old time type of turbine commonly termed water wheel was a rather crude piece of machinery, its appearance, workmanship and performance did not justify any claim for particular care or treatment. The buildings which received such machinery were primitive and far from being an adequate protection against abnormal weather, dust, etc.

Similarly, the operators were not expected to be skilled and trained for high-class equipment.

Not so with large modern hydro-electric prime movers. They are of highest grade design, of best materials, of workmanship which is equal to the best steam turbine practice, working parts fitting together absolutely interchangeably, being machined to thousandths of one inch, ground and polished, suggesting neatness in the station.

Highest efficiency and duty performance being an essential item in the success of the modern enterprise it is only fair to expect that the attendance and maintenance be accordingly of a higher grade. The method of lubrication has attained such perfection that it is almost impossible to soil the machine except through carelessness or neglect, and it should not be difficult for the chief engineer in charge of such a modern plant to insist that his plant be kept in "spick and span" condition.

The building is generally in keeping with the money invested in the enterprise, and it is to be expected that hydro-electric units of latest, high price type and largest capacity be placed in buildings which can be kept clean and free from dust and other impurities without unusual efforts on the part of the attendants.

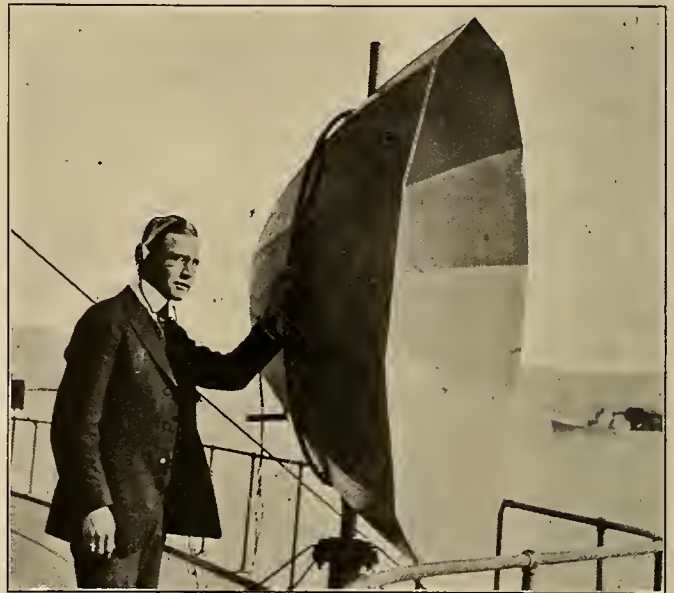
The increasing rate of wages paid to plant operators justifies the logical conclusion that skill and sense

of duty shall also keep in step with the social advancements and as a consequence of this it should not be difficult to obtain results in the attendance on large hydro-electric units, which are in keeping with the progress made and which is constantly being made in this special art of engineering.

SOUND DIRECTION FINDER

A sound localizing device for aiding navigation in foggy weather is being experimented with by the Rieber Laboratories of San Francisco, and was recently tested under actual working conditions by the San Francisco, Oakland Terminal Railways on their ferry boats. The test is reported as a success and the device will soon be put on the market. With the aid of the apparatus it is hoped to ascertain the exact direction of approaching vessels, as well as the location of the particular slip at which the boat will dock.

The localizer, invented by F. D. Rieber, consists of a sound receiving apparatus on the boat, so arranged that it can be used to locate other vessels in



Experimental Tryout on the Fernwood—San Francisco Bay

the vicinity, or tuned to eliminate all noises except a sound source on the pier. For the general location of sound direction, receivers are held to each ear by a head-piece, and as the reflector swings back and forth, record with varying intensities the sounds caught. Only when the reflector points directly toward a sound source, is this recorded equally in both ears. The sound emitter used to locate the pier may be a siren built to give a note of a particular tone, while the receiver is made up of a parabolic reflector with a sensitive receiving apparatus placed within the focal region. These are adjusted so that they indicate with great accuracy the exact direction from which the sound is coming. The distinction between the original sound source and any echo is said to be easily accomplished.

An equipment of this nature would find a broad field of adaptation. Not only on the local ferry and bay shipping but on all ocean-going vessels where progress during foggy weather is difficult, it would be an additional safeguard for the lives and property of the traveling public.

PROPOSED SAFETY LEGISLATION

BY ROBERT L. ELTRINGHAM

(The National Safety Code for the lessening of hazards to human life is without legal status except as it is specifically adopted by city, state or commission. The following proposed legislation as suggested for California would not be amiss in other of the western states. It is supported by the Industrial Accident Commission of California of which the author is the electrical engineer and it deserves your earnest consideration.—The Editor.)

In years past, the constantly growing necessity for a better class of electrical construction has been emphasized in various ways, particularly in the interest of human life and property. It has long been realized that defective wiring in many instances has been the cause of fires, which, in the aggregate, have resulted in enormous property loss. A close investigation revealed the fact that either the materials and equipment were defective or the methods of installation were faulty.

The logical step, then, was to establish standards for equipment, dealing directly with the material used and the matter of clearances, spacing, etc., together with the formulation of rules governing the installation of the same. To establish this, the National Fire Code Committee drafted what is now known as the National Electric Code, which for many years has been regarded as the standard for the method of installing electrical equipment, as well as testing and approving apparatus.

The National Electric Code, until very recently, had for its object fire prevention only, giving little or no attention to the important question of protecting human life from any other cause than fire. That this Code has been effective in the prevention of fires, there can be no question—but the limitations in its administration likewise limit the scope of its usefulness.

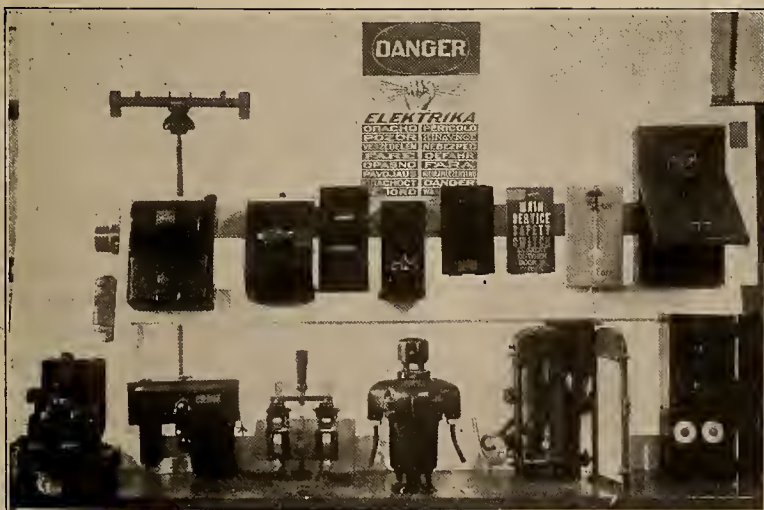
As companies began to transmit electricity longer distances at higher voltage, and its use became more general, the hazards to human life were at once recognized. It then became necessary to formulate a second code, the object of which was the safety of employees and the general public from the consequences of dangerously exposed or defective electrical equipment. So urgent was the necessity for such a code,

that Congress appropriated money and charged the United States Bureau of Standards with the task. The result of their activity has been the compilation of what is now known as the National Electric Safety Code.

The National Electric Code is without legal status except as contained wholly or in part in ordinances passed by incorporated municipalities. This Code is enforced outside of municipalities to a limited extent, and then only by threat of cancellation of insurance by the carrier or an increased rate to carry the risk. As a matter of fact at the present time but one section of the National Electric Safety Code has a legal status in California, the utilization section of which, with certain minor changes, has been adopted and is being administered in all places of employment by the Industrial Accident Commission, and is known as the Electric Utilization Safety Orders.

That the people of the state should receive a full measure of the benefits of both these codes we perhaps will all agree. The question is what efficient and effective means can be devised that these benefits shall be far-reaching? In order that these benefits shall be realized, the provisions of the codes must be adhered to. As to whether these provisions are or are not being adhered to can only be determined by a plan of systematic and uniform inspection of electric equipment within the state, and to accomplish this end jurisdiction over such inspection must be centralized.

A brief, tentative outline of proposed legislation, which, of course, should be subject to discussion and suggestion, is, (1) To provide for an initial inspection of all electrical installations, and to issue certificates of such inspection before power can be supplied or the equipment put into service. (2) The inspection to be made only by an inspector who is qualified, and



AN EXHIBIT OF ELECTRICAL SAFETY DEVICES

which has been arranged by the California Industrial Accident Commission. This group is made up of various types of enclosed externally operated switches for disconnecting supply circuits and for the control of motors; also types of fuses and circuit breakers equipped with overload and no-voltage release features. The danger sign gives warning in sixteen languages.

who has secured a state license. (3) A second inspection of certain classified equipment to be made two years after the initial inspection, and at intervals of two years thereafter, to determine as to whether equipment in operation is maintained in a safe condition, and a certificate of such inspection to be issued by administrative authority. (4) All inspections to be under the jurisdiction of the delegated state administrative authority, with power to cancel any inspector's license when good and sufficient reason can be shown. (5) The establishment of a uniform inspection fee, set by statute and sufficient to defray inspection charges. (6) To license all electrical contractors regularly engaged in the installation of electric circuits and equipment.

In incorporated municipalities where an inspection department adequate for the service is maintained, very little material change should be made aside from an effort to establish reasonable and uniform standards, and the same high standard should be required in unincorporated sections of the state as in cities of the first and second class.

It has frequently been said that electrical equipment properly installed offers the most efficient, economical and flexible power to be obtained anywhere in existence. The disturbances frequently reflected from defective equipment on the consumer's premises to the distribution system, will be in a large measure lessened, while properly installed apparatus is less liable to the effects of unstable conditions to which large distribution net work unavoidably falls heir.

By rigid inspection, the investor, engineer and architect can feel assured that the electrical installation has been carefully surveyed under competent supervision, which should show a liberal return by lessening accident liability and decreasing property loss.

SIGNS IN SAFETY WORK

The necessity for the application of the ordinary rules of good advertising to danger signals is pointed out by a recent article in the *Doherty News*:—

It is a conceded fact that signs are one of the most successful forms of advertising. On every side of us we see signs advertising this or that article, and we carry with us as we go along a mental picture of that sign, so that the next time we go into a store to purchase an article of that description, our first thought is of the brand we have seen advertised. Signs play no less a part in safety work.

It is essential to bring to public notice accident prevention. To convince people of their need of precaution is more difficult than to convey to them their need of a certain brand of chewing gum, because in safety advertising you are giving something away, not selling it, and the public is always skeptical of something which it gets free. Accident prevention advertising, however, must be done in such a graphic manner that a lasting need of the product in question is created in the mind of even the casual reader.

Advertising safety can be accomplished in many ways. Familiar to all interested in the prevention of accidents are the periodic bulletin issues, which are not only intended to arouse the necessary interest in the conservation of human life, but suggest ways and

means of doing so. These bulletins are of great value in arousing and maintaining the interest of the workmen, but their value is greatly diminished if not changed regularly.

It is noticed that people do not often talk about or look at the old signs along the road, but if a new one is erected or the wording of an old one is changed, the "eyes of the world" are immediately attracted, and everybody is interested. At last that new or reconstructed sign gets in the "familiar" class, and it again becomes necessary to dress it up in new form. So it is with safety bulletins, unless they are always kept "on the move" they will attract little or no attention.

The average warning sign generally is of little value after it has been installed for any length of time. In this class of sign there is little opportunity of changing the color, as it is necessary at all times to maintain the red emblem of danger. Sometimes it may be possible to change its shape or the design of the warning emblem on it, but at any rate the sign becomes a more or less standard part of the equipment to the workmen, and so they are apt to overlook it and its value has ended.

The National Safety Council has recently adopted a universal danger emblem, composed of a white square with a heavy black border, hung by the corner, across which two black diagonal lines of the same thickness as the borders are struck; over the center of the diagonals a red ball or disc is imposed. The emblem is to be used either by itself or in conjunction with various words or phrases to warn of the danger existing at the point where it is installed. It is hoped that this emblem will be generally adopted, and that workmen in the course of time will come to appreciate its meaning and value to them. The most important quality of the emblem is that it is not intended to cover any one dangerous place or practice, but the whole field of "danger." Thus in time workmen will come to the understanding that wherever this emblem is seen there must be some hazard existing. The emblem should be intelligently used.

In erecting signs about a plant or property their wording must be carefully considered. A good example of the bad type of sign is probably brought out by the following story:

"Yes, sir," said the station master, "Safety First has spread all over this country. And nobody that comes to Beaver Hill will ever git in no accidents for want o' warning signs about. Jest look at that now."

The stranger gazed appreciatively at the sign nailed on a nearby telegraph post. Its stern message was:

"It is dangerous to stand or walk on these tracks while a train is passing."

"Freak" and extreme signs must be avoided in safety work or we may run up against the same situation as a certain railroad company did when it erected one of the out-of-the-ordinary wig-wag signs at a grade crossing in a rural district. In this instance, a farmer drove on the track, and when he saw the sign start in action at the approach of a train, he stopped his horse and stood in the middle of the track watching it. Along came the "Limited" and the railroad company had a claim for damages on its hands.

ELECTRIC CLOCK AT AGNEWS HOSPITAL

BY L. A. GAIN

(A master clock which is kept to standard time by wireless, controlling fifty-four secondary clocks together with the automatic illumination of the tower dials by night and the striking of the bell and a signal system by which it is possible to record the time at which the night watchmen pass given stations combine to make the installation at the Agnews State Hospital one of particular interest. An account of the electrical features involved follows. The author is with the Sierra and San Francisco Power Company.—The Editor.)



THE MASTER CLOCK
From this station 54 clocks
are controlled

THE necessity of winding fifty-four clocks has been avoided and the attentive guarding of patients by night as well as day has been assured by the recent combined installation of an electric clock and signal station at Agnews State Hospital.

The Hospital, which is an asylum for the insane consists of about 40 buildings with about 30 wards, and covers a large portion of a 400-acre farm.

The installation consists of a master clock, 54 secondary clocks, a

tower clock with 3 dials, 16 night watchman's stations, a large bell on which the hours are struck, a small battery and motor generator set, and a wireless time receiving apparatus.

The master clock is a standard 60 beat movement, with a compensating mercurial pendulum. It is self-winding, rewinding once every minute, and has a guaranteed variation of less than 5 seconds per month.

There are two platinum-iridium contacts on the escapement, one closing at the half minute and rewinding the movement, and the other closing on the minute and actuating a relay in the lower half of the clock case which closes the secondary clock circuits. There are 5 secondary clock currents, and one span, each circuit having a pilot clock in the lower half of the master clock case, which indicates the time of all the clocks on the circuit. There is also one current indicator which indicates the amount of current flowing out on any one of the circuits; this is done by pressing a key which throws the indicator into any one of the circuits.

The 54 clocks are hung in 32 of the buildings, there being one clock in each ward and one in each of such places as the attendants' dining room, laundry, engine room, kitchen, bakery, operating rooms, hydros, doctors' and attendants' quarters and offices. The clocks in the operating rooms, hydros and hospital wards are finished in white enamel to match the room finish.

These secondary clocks do not run continuously, but jump ahead, one minute at a time. Inside the clock is an electro-magnet which receives an impulse from the master clock, once each minute, each impulse setting the clocks ahead one minute. The clocks never require winding, or any other attention when once set, the special feature being that all clocks indicate precisely the same time.

The tower clock has three 5'-6" dials built up of opalescent glass sections, set in a C. I. numeral frame, with Roman numerals. Each is cast in three sections and bolted together, each dial complete weighing about 550 lbs.

The principle of operation of the tower movement is the same as the small clocks. An impulse from the master clock closes the circuit of a small motor, which turns the hands ahead through a train of gears, on which is an automatic trip which opens the circuit when the hands have moved ahead one minute.

The illumination of the dials at night is automatic, the lights being switched on and off at any predetermined hour by a switch which is operated by the crown gear of the clock.

In connection with the tower clock is a large 1000-lb. bronze bell. This bell is not in the same building as the tower clock but is mounted in a wood frame under the water tower some 500 feet distant and 60 feet high. The bell hammer is operated by a relay which is controlled by a selector switch and a transmitter switch.

The selector switch receives the same impulse that operates the tower clock, and requires 60 impulses before it closes its contact; thus selecting the time at which the transmitter shall operate. This closes the circuit of the small motor of the transmitters, which operates a circuit closing attachment which transmits the required number of impulses to the bell relay to strike the hour correctly.

In addition to the clocks there are 16 magneto watchman's stations in various buildings about the grounds, these being so placed that a night watchman in making his rounds must pass each building in order to get to all the stations. It takes one man approximately one hour to make the round of the 16 stations, and he must keep moving all the time to do that, so there is no sleeping on the job.

Each station consists of a low tension magneto generator, set in a cast iron water-tight case. The connecting wires are all concealed in conduits so that they cannot be tampered with.

The watchman is supplied with a crank, which he inserts in the magneto box and gives it a turn. The current thus generated registers the time and place of the station on a chart located in the master clock case in the superintendent's office. The clock case is always locked and it is almost impossible to cheat the apparatus.

The system is operated by a 24-volt storage battery and motor generator set located in the engine room and is automatic in operation.

Inside the battery cabinet is a slate panel on which is mounted two carbon break relays. One closes the main charging circuit and the other closes the bell-ringing circuit, operating the striker solenoid.



THE CLOCK TOWER

The view on the left shows the clock face before installation. On the right, the great bell is being installed. This is not in the tower but is governed by the same master clock.

The battery charging is controlled from the tower clock, on which there is a time element contact which can be adjusted to close from 1 to 20 min. each hour as desired, during which time the battery is charging.

In this case the contact closes, 5 min. before the hour, closing the A.C. motor circuit and starting the motor generator located in the engine room. As soon as the D.C. generator picks up voltage a no-voltage reverse current relay closes, which operates the main battery-charging relay in the battery cabinet, charging the battery. The battery continues to charge, and on the even hour the selector switch closes, which in turn starts the transmitter which operates the bell relay, which in its turn operates the solenoid ringing the bell. At 5 minutes after the hour the contact on the tower clock opens, the motor generator stops, and the no-voltage release opens the charging circuit.

The motor generating set is of the 2 bearing type and consists of a $\frac{1}{8}$ h.p. 110-volt single-phase induction motor with automatic split phase starting attachment. The generator armature is built on the same shaft as the motor rotor, and is wound to generate up to 40 volts.

The above set, including switches, fuses, voltmeter, ammeter, field rheostat, and reverse circuit relay are mounted in a steel cabinet close to the battery.

Correct time may be received each day at noon and 9 p.m. by a wireless receiving apparatus, direct from Mare Island Navy Yard.

The receiving apparatus is set in the lower half of the master clock case and consists of a tuning coil, a cat whisker detector (with bronze whisker and galena mineral), and a pair of high resistance telephones arranged on a head set. The aerial lead is brought down between the walls of the building and when not in use it is connected to a No. 4 ground wire, through a single pole double throw knife switch.

The aerial is built of two stretches of No. 14 hard drawn copper, insulated with eight strain cables and mounted on oak spreaders. The masts are each built of one 20-foot length of 2-inch galvanized iron pipe, capped on top and flanged at the bottom, and bolted to the roof. Each mast is guyed 4 ways with $\frac{1}{4}$ -inch galvanized stranded guy wire, with turnbuckle in each.

The masts are set 90 feet apart and as the building is about 45 feet high, the antennae is approximately 65 feet above ground. Both masts are connected to the ground by a solid No. 2 copper ground wire as protection against lightning. This aerial has with-

stood some very heavy wind storms quite satisfactorily.

The whole installation is wired with No. 18 R.C. cloth-taped and lead covered calite in 2, 4, 6, 8, 16 and 26 wire combinations.

All wiring in the ward buildings is concealed between walls and under floors; any exposed wiring, as in the engine room, is enclosed in iron conduit, with conduit fittings. Wiring to buildings not served by steam tunnels is run in fibre conduit lines laid in the ground.

AN AFTER THE WAR PROBLEM

Rufus Deming, U. S. Consul at Edinburgh, suggests a lesson for United States firms to be drawn from British conditions.

The demand for scrap metal for use in the production of munitions has brought out of various branches of industry considerable machinery that up to the beginning of the war had been much used and has now become practically obsolete. The high prices of scrap metal of all kinds are a strong inducement to the owners of such plants to sell everything that can be spared and then take steps toward re-equipping their works as soon as possible. There are two main causes of this clearing-out process:

1. Most of the industries that were diverted to war purposes found a proportion—in some cases a large proportion—of their machinery unsuitable, and it had to be thrust aside. If it was old or badly worn it can not profitably be installed again and may as well go to the scrap heap.

2. Capital invested in industries seriously affected by war conditions has been gradually withdrawn, the owners turning their attention to more promising fields.

Not the least of the difficulties of industrial reconstruction on a normal basis after the war will be the problem of unsuitable machinery, no inconsiderable proportion of which will probably find its way to dealers in scrap metals. Manufacturers of machinery will require time to construct new equipments, in whole or in part, and therefore to the owners of plants now devoted exclusively to war work the question of industrial preparedness—of readiness to take up old or new lines of production immediately on the cessation of hostilities—is an urgent one. At best the adaptation of present plants to old or new uses will, it is thought, be a slow process, and for some time alert manufacturing firms have been thinking ahead and acting ahead.

THE NATIONAL ELECTRIC SAFETY CODE

BY W. C. WAGNER

(Accident prevention was discussed editorially in the columns of the Journal of Electricity in the issues of October 1 and November 1, 1917. In the latter issue the Electrical Engineer of the California Industrial Accident Commission contributed an able discussion on this timely subject. Below is an article by the Electrical Engineer for the U. S. Bureau of Standards at Washington, who has been making a personal study of the conditions of standardization and safety code work on the Pacific Coast for some months past. This able article should receive unusual attention and thoughtful consideration by engineers throughout the West.—The Editor.)

Although most of the activities of the Federal Bureau of Standards at the present time are devoted to assisting in the solution of pressing war problems, the work including that on accident prevention is by no means interrupted. The Bureau and its many conferees are united in the judgment that the conservation of the lives of the public and of our industrial soldiers here is no less essential than the conservation of the lives of our military soldiers in Europe.

The Bureau is thoroughly in sympathy with the editorial expressions of the Journal of Electricity in its issue of October 1, 1917, regarding appropriate bases for accident prevention standards. It agrees with the editorial statement that "Only by the most careful consideration of special conditions involved, with the due weighing of the financial demands, can an industry hope to be of maximum use to the public it serves, and at the same time render its service at reasonable rates."

The Bureau also thoroughly agrees with the further statements:

"It must be recognized that there is a human limit to which expense and design can be carried to prevent the infinite and remote possibilities of accident. Such recognition is necessary in the drafting of the proposed rules of safety now under discussion by the Bureau of Standards or they must fail of their real purpose."

"Sane, reasonable demands in construction and operation in which the higher motives and ideals of all concerned—the engineer, the employer, the laborer, the general public—are drawn into play, can alone bring about the desired result—namely, the prevention of accident."

All these factors, as a matter of fact, have been most carefully and constantly considered, but if it had not been desired to accord them this consideration such would have been demanded by the thousands of conferees, including a good representation of Pacific Coast utilities and workers who, at the Bureau's earnest request, assisted at great expense of time and effort in the preparation of the National Electrical Safety Code.

Not only were their suggestions invited and urged at these conferences but also through constant correspondence, and all suggestions have received most careful and, so far as known, satisfactory consideration.

The sweeping statement that "In the west, due to sparsely settled conditions of the country, and due to the unique engineering problems there, these rules have proven wholly inapplicable," requires convincing evidence to be of value in improving any proposed standard, especially in view of the recent actions taken by western states to secure the adoption of the Safety Code.

That the Code even today is perfect or anything like perfect or beyond the possibility of improvement, cannot be asserted. It has avoided the issuance of general rules not applicable under varying conditions of climate and population density, and endeavored to care for these variations in a broad way rather than providing for an unnecessarily large number of variations in practice.

A consideration of financial demands should obviously include those of all the interests involved,—lighting and power and railway companies, telephone and telegraph companies, electrical workers, purchasers of service, and the general public. It has been the common experience that the immediate financial demands of one class of interest may often be met to its entire satisfaction only by ignoring the financial demands of other interests, and in considering these demands the public must of necessity also be considered. It is the belief of the Bureau, supported by the expressed convictions of its thousands of conferees, that when the considerations of all the various interests are "brought into play," the ultimate interests of all are the same, and that such considerations will, as stated "bring about the desired result, namely, the prevention of accidents." This has been at all times the Bureau's method of pursuing the subject.

It is easily seen that for electrical workers, manufacturers of electrical equipment, and electrical utilities operating in more than one state, and for the general public also, the economy and stability as well as safety in electrical practice is much more promoted by its generally applicable standard than by those only locally applicable. Extensions of industry are encouraged, and capital will more readily flow to this better stabilized industry. That this broad attitude toward the subject is held also by western engineers and workers is evidenced by the recent actions by western commissions in adopting or recommending the Safety Code as a relief from somewhat drastic, inadequate and unsatisfactory statute requirements.

The Bureau is not unmindful of the wonderful progress of electrical engineering and safety matters in the West. Its early development of high tension lines and pioneer statute rules are good evidence of this progress. The Safety Code has indeed been greatly benefited by these advanced steps as have others the country over. Their utility is never denied, even though a standard may be developed which will exclude some dangerous features of construction and operation not touched upon by previous practice or rules. When engineers and workers in general agree that such standard is a good and reasonable one, and a warranted advance beyond existing requirements, it is believed proper to recommend it for new construction, but not in a wholesale retroactive application

frequently suggested by local interests. It must not be forgotten that most western construction in most respects is now safe and more expensive than could fairly be required by a code of **minimum requirements**. The Code simply excludes definitely bad practice and affords a guide to minimum good practice and places the emphasis where it truly belongs—where expenditure brings commensurate returns in added safety.

It is now generally agreed by the wire owning companies, electrical workers, railroads and others, that the rules of the Safety Code are the most adequate and reasonable set yet developed, and that it is far more preferable to incorporate necessary revisions brought together from all parts of the country and inserted in one national code, than to continue the tendency which has decreased in recent months, toward the development of separate state standards which would contain peculiarities entirely unwarranted, although possibly insisted on by certain local interests. Certain inadvisable provisions governing electrical practice may of necessity temporarily remain because of existing state laws. Relief from these, however, can more readily be secured in the presence of a single national standard.

The Bureau has been greatly assisted in the preparation of the Safety Code by the accident, railway, and public service commissions of the West, and by the engineers and representatives of all the western states' interests. It will be glad for the Journal of Electricity to offer them in the bureau's behalf, any co-operation in any respect in which the Bureau's facilities for laboratory research and for the conduct of nation-wide investigation can be made of service to them, in the solution of their problems.

There is now in the course of preparation an Engineering Memoranda, in which it is proposed to include the bases for values assumed in the Safety Code and give graphically the interpretations of vari-

ous Code provisions. The Bureau will welcome any suggestions which experience can supply to make this supplement to the Code of the greatest practical value.

In closing it is well to call attention to other investigations that the Bureau now has under way. The Bureau has long been helpfully co-operating with those interested in various other standards of good service and good practice as applied to public utilities. The results of a study of electric service given in Circular 56, for gas service in Circular 32, and for gas testing in Circular 48, are typical of that character of work accomplished. A "National Gas Safety Code," "Standards for Street Lighting," a "Household Safety Circular," and a Circular on Grounding are in the course of preparation. Technological papers 28, "Methods of Making Electrolysis Surveys," and 52, "Electrolysis and Its Investigation," and many other papers summarize the work done in the prevention of electrolytic damage to underground metallic structures by stray currents. Experimental studies have been made in telephone service, to determine the practicability of improvement. The important problem of high tension insulator depreciation has been taken up at the request of various interested parties and the special committee of the Pacific Coast Section of the N. E. L. A. expects to actively co-operate in this work.

Many other equally important and helpful phases of the Bureau's work in the investigation and solution of industrial problems relating to (1) Weights and Measures, (2) Heat and Thermometry, (3) Electricity, (4) Light and Optical Instruments, (5) Chemistry, (6) Engineering Research and Testing, (7) Metallurgy, and (8) Structural Engineering and Tests of Materials are catalogued in the List of Publications sent on request.

THE WEST GREETES THE EAST

Here is an X-ray photograph superimposed upon a map of the United States, symbolic of greetings from the West to the East. The two hands clasped are those of W. C. Wagner, electrical engineer for the U. S. Bureau of Standards at Washington, author of the above article on the Safety Code, and Robert Sibley, president of the San Francisco Electrical Development League, editor of the Journal of Electricity. The picture was taken during an X-ray lecture before the San Francisco Electrical Development League by F. H. Rieber of the Rieber Laboratories who gave an exceedingly interesting and instructive talk on this subject, in the ball room of the Palace Hotel on Dec. 12, 1917. At this meeting Mr. Wagner gave a very vivid description of the helpful work the Bureau of Standards is doing at the national capital.



THE OPEN DOOR OF THE PACIFIC

(Central America is just awakening to the possibilities of electricity—New Zealand is already one of the best markets for American electrical ware—Russia, although temporarily closed by war conditions, is going to offer in its regeneration, one of the best undeveloped fields for the electrical man to be found anywhere. A revision of present methods of foreign trade and a new daring and enterprise must meet the new possibilities of the Pacific.—The Editor.)

BRAZIL AN UNDEVELOPED FIELD

The State of Sao Paulo, Brazil, is pointed out as being a particularly good field for the import of electrical supplies and machinery. The use of electric power is increasing and the United States is obtaining a larger share of the trade.

There is much undeveloped water-power. Government engineers have computed the horsepower that could be generated at the principal waterfalls at 1,876,300, and because coal does not exist in the state and the wood now burned in both locomotives and stationary boilers costs as much as coal at the rate of \$25 per ton, it is certain that water power will play a most important part in the development of manufacturing. Much of the power required for the smaller industries in this city is derived from a hydroelectric plant and a great deal of the plantation machinery throughout the state is moved by current generated in 38 similar plants located near the larger towns. All these towns and many villages are lighted by electricity.

The principal falls—the Marimbondo, with 580,000 horsepower; the Agua Vermelha, with 300,000; the Ouca, with 220,000; and the Pato, with 120,000—are all on the Rio Grande, which forms part of the boundary between the States of Sao Paulo and Minas Geraes.

On the Tiete River, which flows through the center of this State, are the Avandava, with 61,000 horsepower; the Itapura, with 54,000; the Macuco, with 24,500; and the Cruzes, with 19,000.

Located on the Parana, which separates Sao Paulo and Matto Grosso, are the falls of Urubupunga, with an estimated latent horsepower of 447,000.

The Paranapanema River on the southern boundary has the following falls: Salto Grande, with 30,000 horsepower; the Palmital, with 12,000; and the Aranhas, with 7,500. Another river in the center of the state, the Piracicaba, an affluent of the Tiete, has a waterfall whose energy is estimated at 20,000 horsepower.

PERMANENT ELECTRICAL EXHIBIT IN URUGUAY

The Montevideo electric light and power plant, which is owned and operated by the State, will within a few days inaugurate a section devoted to the exhibition of electrical apparatus and the furnishing of information. The purpose of this service is to encourage the use of electricity.

The showrooms are very attractively arranged and include separate divisions for appliances used in dining rooms, pantries, kitchens, bathrooms, dressing rooms, laundries, etc. In each case the division is completely furnished and shows exactly how the various appliances are installed and used. Attendants will explain

the operation of apparatus and furnish information as to rates, etc. In many cases special measuring instruments illustrate the exact consumption of current.

For the present the plant proposes to sell kitchen stoves only. However, it is not impossible that it may later sell other appliances. Articles in considerable variety are already on hand for exhibition, and the management will be glad to receive catalogues from manufacturers of all kinds of supplies and apparatus, particularly such as are for household use.

Electricity is very widely employed at Montevideo for lighting, and its use for other purposes is growing. Electric fans have been popular for some time. The director of the electric plant states that the cooking stoves imported have found a ready sale, and that it has proved difficult to secure a sufficient supply. Electric heating stoves and irons are also growing in



THE HIGHEST TRANSMISSION LINE IN THE WORLD

The construction of a high power transmission line across the Andes in South America. The tremendous altitudes are not apparent in the picture, but the scene is well above the tree line. The bleak nature of the country is characteristic of the region through which this construction work was done.

popularity. The middle and upper classes are as a rule quick to appreciate an innovation which offers marked advantages over old methods.

In order to encourage the use of electricity in households the plant recently established a special rate of 3 centesimos (3.103 cents) per kilowatt hour for current used for domestic purposes. This does not include lighting service. For electric cooking stoves and heaters a further rate of 2 centesimos (2.068 cents) per kilowatt hour is offered.

The voltage at Montevideo is 220, and the city has alternating current.

WATER RESOURCES OF HAWAII

The rainfall on the Hawaiian Islands varies from a few inches to nearly 400 inches a year, and as much of the fertile area is made to produce through irrigation,

the study of the water supply of the islands is a matter of great importance. It is stated that the critical period is approaching in Hawaiian agriculture, and that the time has come when it becomes necessary to have all the information possible regarding its available sources.

In making plans for power, irrigation, municipal water supply, and other projects involving the use of water from any stream it is necessary to have data from which the total flow of the stream and its variation from day to day throughout the year can be obtained. Since November, 1909, a study of the streams of Hawaii has been carried on at gaging stations, maintained by the United States Geological Survey, Department of the Interior, in co-operation with the Territory of Hawaii, and Water-Supply Paper 430, "Surface Water Supply of Hawaii," just issued by the Geological Survey, Department of the Interior, gives the results of this study during the period from July 1, 1913, to June 30, 1915. It contains a list of the gaging stations maintained on the islands, estimates of the daily and monthly discharge of the streams, and the results of studies of rainfall at many points. Water-Supply Paper 318 gives the results of water-resource investigations in Hawaii for the years 1909-1911, Water-Supply Paper 336 the work for 1912, and 373 the work for 1913.

MEXICAN MARKET FOR ELECTRIC METERS

Probably the only cities in the State of Tamaulipas, Mexico, in which electric lighting plants are established are Tampico, in the extreme southern part of the State; Victoria, the capital, in the southwestern central section, with an approximate population of 18,000; and Matamoras, the gateway to this part of Mexico, situated just across the Rio Grande from Brownsville, Tex., with an estimated population of 8,000.

In the last two named cities little if any electricity is used for other than lighting purposes, except in the operating of motion-picture machines, for electrically operated musical instruments, and in a few cases for domestic purposes.

The electric lighting company in Victoria is financed by Mexican capital and managed by a Mexican citizen, while the one in Matamoras is financed principally by American capital and managed by an American citizen.

Machinery Equipment of Plant

The machinery of the Matamoras plant consists of a 175-kilowatt generator, connected direct to a 175-horsepower engine, and it has a reserve 75-kilowatt generator with a 75-horsepower engine, the machinery all being of American manufacture. An alternating current is used, and an outside voltage of 1,200 is carried. All outside wires are carried on poles, and inside wiring is both visible and concealed. While there are some chandeliers, the majority of houses use cord for suspending lamps.

Until recently the service of the company in Matamoras has been very poor. Several times a month the city has had no lights throughout the night, and there have been similar conditions at frequent intervals for shorter periods. This was attributed to various rea-

sons, such as lack of fuel, accident to machinery, difficulty in securing competent workmen, etc. A rebate is allowed by the company when the lights are off for five consecutive nights. During the last two months little or no difficulty has been experienced in the operation of the plant.

Plant Operated Only at Night

Early in the summer it was thought that the plant would be operated night and day, but up to the present time the power has been on only from sundown to sunrise, the period for lighting the city.

With the exception of a few places, such as motion-picture houses, etc., where the owners have purchased and installed meters, none are in use. The tariff of charges per month is based on the number of lights installed.

Advantage in Use of Meters

It is thought that this kind of a tariff furnishes a temptation to subscribers to run private wires, and use a greater number of lights than contracted for with the company, and while a \$10 fine is assessed on a subscriber who is found using larger or a greater number of lights than contracted for, little attempt has been made to keep a check on the amount of electricity used in the various buildings. It has been pointed out to the manager of the company that the installation of meters at a monthly rental, while creating an initial expense, would soon prove profitable, as it would have a tendency to increase the sale of current. Under the present tariff the householder in making a contract with the company naturally arranges for the least possible number of lights. He does without lamps in rooms other than where their use is needed the greater part of the time, and as the need arises temporarily transfers the lamps to rooms for which none are contracted. With meters installed lights would be placed in all rooms, and without doubt a greater amount of electricity would be used.

It is thought possible that if reasonably cheap and reliable meters can be furnished the company could be induced to use them.

NATIVE AGENTS FOR PANAMA TRADE

Business firms of the United States lose a lot of business in Central and South America, in normal times, by failing to see the practical wisdom of a method used both by British and German concerns in extending their influence. This method consists of using, to a certain extent, native agents and employees in the country in which the business is located.

European business, long experienced in developing foreign trade and making foreign investments profitable, has come to regard this expedient as almost an axiom. Where a business is being built up the promoters seek to get some of the native residents into it, in order to stabilize their general political and commercial position. If this is not done, and the concern becomes large, with foreigners exclusively in the more important and lucrative positions, the community becomes more and more jealous and hostile, and all sorts of devices are resorted to to "get even." American firms are far less thoughtful of this than European, and the result frequently is that where competition exists, the Europeans get the best of it.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The questions of whether a property should be held at greater value because it may some day be used as a reservoir site and what effect the interval before its use should have on the value allowed are problems which confront the engineer and the courts equally in the fixing of the rate-base for public utilities. The opinions of the Master in Chancery in regard to various of the San Francisco reservoir sites are here quoted and commented upon. The author is a consulting engineer and authority on valuation matters.—The Editor.)

COURT DECISIONS ON RESERVOIR LAND VALUATION

The opinions, relating to the value of reservoir land in the San Francisco Bay region, which have been formed and which have been submitted to much discussion may not always have had their origin in sound reasoning. This is not to be wondered at in view of the difficulties which have been pointed out. But in the course of time the values have become more and more clearly defined as will appear from a consideration of the report of the Standing Master in Chancery, Mr. H. M. Wright, in the case of the Spring Valley Water Company vs. City and County of San Francisco which was recently made to the court. (August, 1917.)

With reference to the 336 acres in the Merced Lakes the Master finds that they were of a market value of \$336,000 or \$1000 per acre during all the years 1907 to 1915. He says:

"I think they were worth that in 1907 and in view of their future partial abandonment as described, I do not believe they can be considered as increasing in value during this period."

He also says:

"This is approximately the value of the gullies leading into the lakes. In other words, if the lakes were not there, and their sites to be condemned, the land would resemble and probably be no worse than these gullies. To thus assume no additional value for reservoir availability" (referring to the appraisal submitted by plaintiff) "over the value for other uses seems fair and conservative."

On the question of the best factors that bear on the determination of market value in the case of the reservoirs on the San Francisco peninsula, the Master states that he finds his judgment relying rather on other considerations than their original cost and he enumerates as the factors which to his mind were most satisfactorily determinative of market value in 1913 and other years concerned:

- "(1) the state of the market for these reservoir lands
- "(2) the valuation by Judge Farrington
- "(3) prior valuations by persons in authority and others."

The valuation by Judge E. S. Farrington, here referred to, relates to the findings of the court in a prior rate case in which the valuation applied to the year 1903.

The Master comments on the relative value of the Merced Lake lands and the peninsula reservoirs as follows:—

"We are justified, too, in bearing in mind the fact that the Merced reservoirs have in this case been found to be worth \$1000 per acre, valued on the basis of adjacent land of similar character and without any increase by reason of availability

for special uses. By reason of its low level, its limited supply and poorer quality of water, and its approaching disuse except for emergencies, its value is necessarily less than the principal reservoirs of the system; on the other hand, proximity to valuable lands and shortness of conduits are influences tending to raise the value. It may well be that these counter-acting influences may properly be considered in balance. At any rate, we may say that there is here some indication that the peninsular reservoirs are worth not less than \$1000 per acre."

The problem of the valuation of the reservoir lands in this rate case is thus stated by the Master:

"Attacking our problem directly, what was the state of the market for reservoir lands in the years 1907-15? For this purpose, I assume that the reservoirs were not in existence, that the reservoir lands were in private hands devoted to other uses than public uses, and, to meet the suggestions of the Supreme Court in the Sage case, and of the English Court in the Lucas case, that condemnation proceedings had not been begun."

The Master referring to the three peninsula reservoirs, the Pilarcitos, the San Andreas and the Crystal Springs then continues:

"As for the supply, these three reservoirs are unique and indispensable. There are no others on the peninsula or elsewhere within a similar distance comparable with them.
* * *

"To assist our thinking as to what would be the market value, we may visualize the situation as being one of sale from a private owner or owners, as willing sellers, to willing purchasers, either the present plaintiff, the city, or any other person that may be concerned. The price thus arrived at would be the same as the award in a condemnation, as I understand the law."

The Master thereupon refers to the bartering that might take place and to the fact that expert witnesses might be consulted and then says:

"It is hard to conceive that they would be far apart considering the presence of competition unless the seller endeavored to obtain a prohibitive or monopoly price. Let us to avoid that assume that the seller took Mr. Grunsky's judgment and asked \$1400 per acre; and that nevertheless, in view of the absence of comparable sales or demonstrable values, their minds were in an uncertain state as to market value like a chemical solution needing a precipitant to induce crystallization. I think without doubt Judge Farrington's decision and Mr. Grunsky's prior valuations as City Engineer would furnish such a precipitant. I have no question that the parties would agree that the starting point must be a value of \$1000 per acre in 1903. Where the whole matter is uncertain, a decision of the question by one in authority is usually readily received by the human mind so as to make an end of thinking."

After some further discussion of facts presented in the case as having bearing upon the value of reservoir land the Master deals with the question of appreciation in the following words:—

"I conclude, therefore, that we may reasonably start with the assumption that the peninsular reservoir lands were, in 1903, worth \$1000 per acre, Judge Farrington's figure. Have they appreciated in the succeeding ten year period, and if so, at what rate? It is clear to me that an appreciation has occurred. The importance of these reservoirs and the increasing demand for them, the increase in value, of lands of an agricultural character throughout the state and the especially marked increase in San Mateo county, all indicate in a broad way that they may be considered as appreciating in value during the decade."

After having thus referred to the marked increase in values of real estate of all kinds with special reference to San Mateo county within which the reservoirs are located and with reference to the farm lands of the entire state, the Master cites some of the rates of population growth and appreciation from the data submitted by the writer and continues:

"It is to be noted, however, that in the matter of adjusting watershed values among the various years here in controversy, the parties have themselves stipulated a more moderate rate of appreciation, viz., 100% for 1912-13, 1913-14 and 1914-15; 95% for 1911-12, 90% for 1910-11, and 85% for 1907-8, 1908-9 and 1909-10. And this stipulation was expressly extended to reservoir lands. There is lacking any stipulation concerning the years between 1903 and 1907, but the statistics noted show an appreciation, and in the spirit of the stipulation, it is fair to say that during the four years 1903-06, the values of the reservoir lands remained the same at \$1000 per acre, and that this value was 80% of the 1913 value."

The values as determined by the Master according to this finding range from \$1000 per acre for the years 1903-6 to \$1250 per acre for the years 1912-15. It is interesting to the writer to note that the annual appreciation represented by these values is about 3.3% and that starting with the Judge Farrington value of \$1000 per acre in 1903, the value at this rate of appreciation throughout the decade would have been \$1360 per acre in 1913, which is but slightly below the appraisal as made for that year by the writer.

In reference to the San Antonio and Valle reservoir sites on the Alameda Creek system, where but small increase of value due to possible future use as reservoirs was claimed, the Master made no addition to the value for other uses, preferring to accept the lower value as a conservative allowance. The amounts involved as additions, under valuation as reservoir sites, are only \$8000 to \$12,000 in the case of the San Antonio and \$4000 to \$5000 in the case of the Valle site.

At Calaveras, too, the accepted valuation was that made on the basis of uses other than as a reservoir. In 1913 work on the Calaveras dam had commenced but the reservoir was not yet in use. The Master says:

"If this were a sale or a condemnation, as of 1913, I should adopt a figure at least equal to Mr. Grunsky's (\$200 per acre). The question is whether it is valued, in rate-fixing proceedings, with reference to its actual use as watershed, or with reference to its potential and approaching use as reservoir. In the 1903 case Judge Farrington discussed this matter and valued the land as watershed only."

The valuation of the writer referred to in this quotation is about twice the value placed upon the land by other experts appearing for the plaintiff who gave consideration only to uses other than reservoir use.

Farther along in his report the Master, after stat-

ing that Judge Farrington was right in omitting the exploration work at Calaveras from the capital in use in 1903, says that both common sense and authority requires the inclusion of these expenditures in the years beginning with 1910 when work on the dam began to be prosecuted quite actively. He then continues:

"This result is not consistent with my treatment of the Calaveras reservoir lands. Those lands were not appraised at their full market value, considering their availability for reservoirs, but as farm lands only. This case has been considered in subdivisions throughout a period of over six months, and the report written as the parts were decided. The principle applied to the dam was appreciated then, as the language shows, but for reasons then appearing to me sufficient, and not now clearly in mind, the additional value of something over \$200,000 was not considered. After all it is the final result that is important, and I do not now deem it necessary to go through the necessary recomputations and rewrite that portion of the report."

When, in other words, according to this conclusion, the time has come when the use of a reservoir site can no longer be postponed, it would appear proper to recognize that its market value is not necessarily determined by ordinary uses but rather by its special adaptability to store water.

It has not been made clear why when market value is under consideration this should not apply at all times. The fact that a tract of land by reason of topographic features is suitable for use as a reservoir and will some day be converted into a reservoir is an element of value. The addition of value due to possible reservoir use may be trifling when the time of such special use is remote and difficult to forecast. It will become more definite and material the nearer the time approaches when such use will be a necessity. But there is in the case of the reservoir not yet in service, always the other question to be considered whether or not the property is a useful member of the water-supply system and whether if useful, for example, as a watershed any necessity of holding it as a reservoir site can be shown. Should not the higher reservoir value as part of the rate-base date from the time that the property goes into use as a reservoir? This is apparently the view accepted both by Judge Farrington and the Master, Mr. Wright.

WAR ECONOMY IN AUSTRALIA AFFECTS UTILITY ORGANIZATIONS

Although trade conditions in Australia appear to be fairly satisfactory, the government has adopted a policy of retrenchment along all lines of activity.

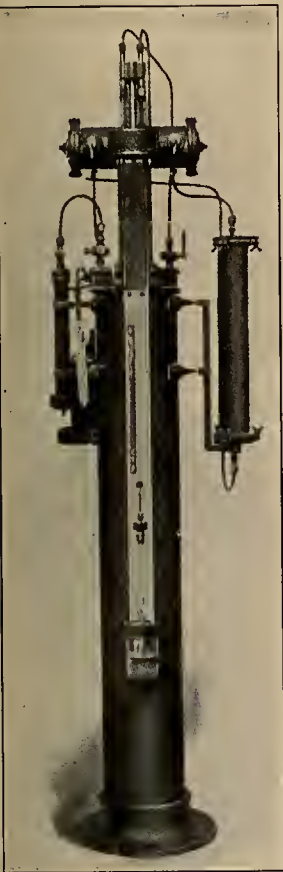
The State governments also have curtailed outlays in deference to the expressed wish of the British government for the greatest economy in their public-works expenditures. In New South Wales construction on extensive public works has been stopped. In Victoria the electrification of the Melbourne suburban railways has been slowed up as much as possible. The Queensland government, although having made purchases of country properties, has not done much in railway building or other improvements. Western Australia, which has suffered an industrial depression, has had to close or curtail various government enterprises. South Australia, although in a fairly sound condition, has also pursued an economy policy.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(In view of the national coal and oil shortage as well as in the interests of economy, the testing of the flue gases of power plants using fuel oil as a power source is a matter of the greatest importance. By such tests the incomplete combustion of fuel is ascertained and the furnaces regulated. The methods used for this analysis are considered in the following article.—The Editor.)

We have found in preceding discussions that for practical purposes the gases passing out through a chimney from the central station boiler are usually considered to be composed of carbon dioxide, oxygen, carbon monoxide and nitrogen. Since these constituents are usually determined volumetrically we shall represent them by the symbols V_1 , V_2 , V_3 , and V_4 , respectively. We shall now proceed to a discussion of the usual methods employed in determining the flue gas analysis during the boiler test.



A carbon dioxide recorder

The Taking of the Flue Gas Samples and Analysis—Certain solutions have been found in the chemist's laboratory that will absorb carbon dioxide and will not absorb oxygen, carbon monoxide or nitrogen. Again another solution has been found that will absorb oxygen but will not absorb carbon monoxide or nitrogen. And still a third solution has been found that will absorb carbon monoxide but will not absorb nitrogen.

If then a contrivance can be set up so that a flue gas sample may be successively washed in these solutions, a means is provided for determining an analysis by volume.

Let us then see how the flue gas analysis is taken. The apparatus usually employed consists of a wooden case with removable sliding doors which contain a measuring tube or burette B, three absorbing bottles or pipettes, P' , P'' , and P''' . In addition a leveling bottle A and connecting tube T are also provided.

The tube E is connected to the point in the chimney situated immediately beyond the breeching. The instrument is first set in operation by closing the stopcocks f, g, and e, d being open. By lowering the leveling bottle A, a sample of the gas is drawn into the burette B. This preliminary sample is then expelled to the atmosphere by raising the bottle A and allowing the gas thus put under pressure to pass out through a by-pass at d. This process is continued until it is considered that an average sample has been drawn into the burette B. The leveling bottle A is next lowered so as to cause the water in burette B to come

to its zero mark. By raising the bottle A the water is again forced into burette B and the gas sample expelled through stopcock e into the pipette P' , in which there is a chemical solution that absorbs carbon dioxide, but will not absorb oxygen, carbon monoxide or nitrogen.

To Ascertain the Carbon Dioxide Content of a Flue Gas.—Exactly 100 cu. cm. of gas were originally drawn into the burette B. If now the leveling bottle A is again lowered to draw the gas back through stopcock e, the volume in the burette will be found to have lessened in quantity so that instead of reading zero it now reads N_1 which indicates directly the volume of carbon dioxide that was present in the gas, for evidently this volume has been absorbed in the pipette P' . Hence, we have

$$V_1 = N_1 \dots\dots\dots (1)$$

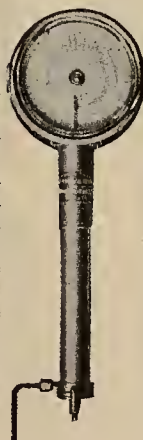
To Ascertain the Oxygen Content of a Flue Gas. In a similar manner the gas sample in the burette B is now forced through pipette P'' , in which is a solution that will absorb free oxygen in the sample but will not absorb carbon monoxide or nitrogen. By means of the leveling bottle A, the sample is next drawn back into the burette B and a reading N_2 noted. It is now evident that the oxygen content of the flue gas may be computed from the formula

$$V_2 = N_2 - V_1 \dots\dots (2)$$

To Ascertain the Carbon Monoxide Content of a Flue Gas.—The pipette P''' similarly contains a solution which readily absorbs the carbon monoxide present in the gas, but will not absorb nitrogen. Hence we proceed as in the two former instances and return the gas sample to the burette which now reads N_3 . Consequently the carbon monoxide which was present in the

THE RECORDING GAUGE

A revolving dial record is constantly in operation in the modern central station for fuel oil consumption in order to ascertain the carbon dioxide component of the flue gases. This view gives the reader a conception of its appearance as installed in the power station.



flue gas is obtained from the formula

$$V_3 = N_3 - (V_1 + V_2) \dots\dots\dots (3)$$

To Ascertain the Nitrogen Content of a Flue Gas. We assume that all of the gas which remains in the sample is nitrogen. Consequently the nitrogen content is obtained from the formula

$$V_4 = 100 - (V_1 + V_2 + V_3) \dots\dots\dots (4)$$

An Approximate Check on the Orsat Analysis.—Air is found by weight to have 76.85% hydrogen and 23.15% oxygen. By volume this analysis will be found to be 79.09% nitrogen and 20.91% oxygen. Since 1

unit by volume of oxygen forms 1 unit by volume of carbon dioxide in the burning of pure carbon the actual percentage of nitrogen in the chimney gases is not altered but should remain 79.09% if perfect combustion is maintained.

On the other hand, when imperfect combustion is under way, or in other words, when some carbon monoxide is being formed, 1 unit by volume of oxygen forms 2 units by volume of carbon monoxide. Hence when pure carbon is the fuel, the sum of the percentages of carbon dioxide, oxygen, and $\frac{1}{2}$ the carbon monoxide must be in the same ratio to the nitrogen present as the oxygen in the air is to the nitrogen component, namely as 20.91 : 79.09. This is a convenient check upon a flue gas analysis in the progress of the experiment. Thus if an analysis of chimney gas is found to contain by volume 9.5% car-

proves of no avail since the hydrogen content is not taken account of in the Orsat or flue gas analysis. As the relationship serves, however, to clinch our ideas of volumetric proportions of entering air and outgoing flue gases, it is well to bear it in mind.

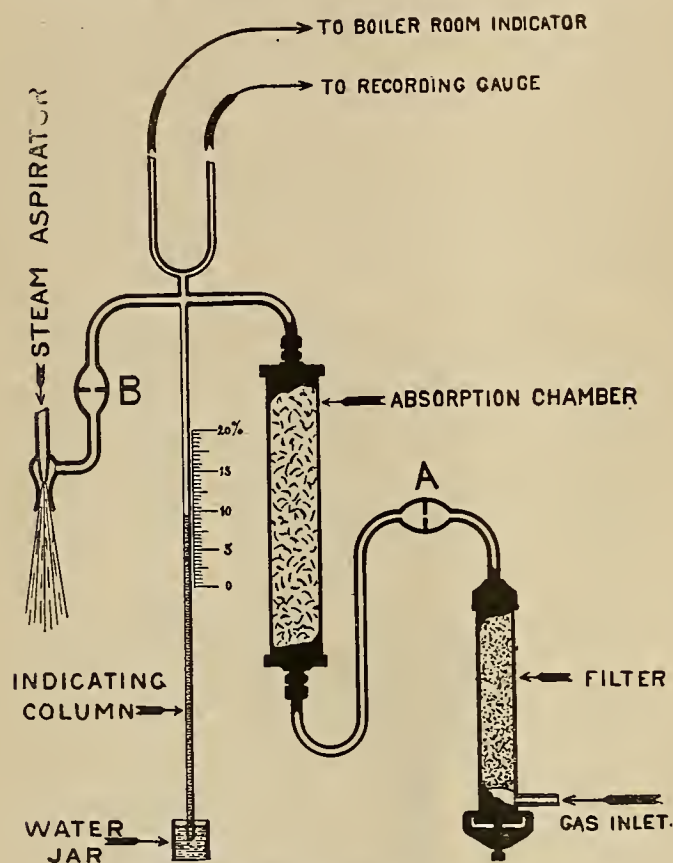
In boilers fired by coal containing little hydrogen the CO does not usually exceed 1 or 2% and the sum of the Orsat readings $\text{CO}_2 + \text{O} + \text{CO}$ is usually between 20 and 21%. When burning oil, on the other hand, the sum of these readings may be as low as 16 or 17% due to the large proportion of hydrogen in the fuel, which means an apparent nitrogen content of 83 or 84%. The reason for this is that the water vapor formed by the burning of hydrogen condenses in the Orsat apparatus and occupies practically no volume, but the oxygen which unites with the hydrogen brings with it the same proportion of nitrogen as does the oxygen that unites with the carbon. Consequently the Orsat indicates a larger proportion of nitrogen than would occur if the fuel were pure carbon.

Chemical Formulas for Preparing the Absorption Solutions.—The bottle A and the measuring tube or burette B contain pure water only while the first pipette P' in which carbon dioxide is absorbed contains sodium hydrate dissolved in three times its weight of water. The second pipette P'' in which oxygen is absorbed contains Pyrogallic acid dissolved in sodium hydrate in the proportion of five grams of the acid to 100 c.c. of the hydrate, and in the third pipette wherein carbon monoxide is absorbed cuprous chloride is contained. These chemicals are sold by most of the large dealers.

Another series of formulas which work equally well and in many cases are more easily prepared, are the following:

To absorb the carbon dioxide, potassium hydroxide is used, and is made by diluting 500 grams of commercial potassium hydroxide in one quart of water. To absorb the oxygen, potassium-Pyrogallite is used wherein five grams of solid acid in 100 c.c. of potassium hydroxide above mentioned is prepared. When over 28% of oxygen is present, it is necessary to use 12 grams of commercial potassium hydroxide to 100 c.c. of water. To absorb the carbon monoxide, cuprous chloride is used which is prepared by covering the bottom of a quart measure with cuprous chloride (Cu_2O) to a depth of $\frac{3}{8}$ ths of an inch. The measure is then filled with hydro-chloric acid, shaken and allowed to stand until it becomes colorless. The copper wire is then placed in the solution and left to stand for a number of hours.

The Hempel Apparatus for Determining the Hydrogen Content.—It is seen from the above description that no means are provided to ascertain whether or not the hydrogen content of the fuel is being properly consumed. This determination can only be made by the refined laboratory apparatus of the chemist. The author considers that such a test is beyond the scope of this work, hence the description of the Hempel apparatus and its operation will not be undertaken in these pages. Standard works on this subject are, however, available in all chemical engineering libraries for those who desire to go into this subject. Except for refined tests covering certain particular problems in combustion the Orsat analysis of flue



A RECORDER FOR COMBUSTION OPERATION

From the discussion in the text it may be inferred that a knowledge of the carbon dioxide component of the flue gas enables us to judge concerning the combustion taking place in the furnace. The principle involved in the type of carbon dioxide recorder as shown is that a change of volume in a gas produces a change of pressure. A continuous sample of the flue gas enters at A and in passing through C the carbon dioxide component is absorbed and consequently a reduction in pressure takes place. By the calibration of suitable manometer tubes the instrument may be made to read the carbon dioxide component direct.

bon dioxide, 10.2% carbon monoxide, 5.2% oxygen, and 75.1% nitrogen, according to this proportion, we should have

$$9.5 + 5.2 + \frac{10.2}{2} : 75.1 = 20.91 : 79.09$$

Upon investigation this will be found to be approximately true and well within the limit of experimental accuracy.

As California crude oil contains usually about 11% of hydrogen, the ready checking above indicated

gases is considered sufficiently accurate for power plant practice. Indeed, in most instances, as we shall see, the determination of the carbon dioxide component alone gives us sufficient information for approximate combustion adjustment.

Conclusion on the Orsat Analysis.—By care and a little patience, the experimenter will find that the Orsat analysis as above set forth can be taken easily and quite accurately, and thus a splendid lot of data obtained wherewith steam boiler economy and operation can be checked. If wrong conditions of combustion are found to prevail the proper adjustments can then be made in the furnace and its accessories.

We shall next proceed to formulate some equations whereby the data gained from the flue gas analysis may be thrown into more useful analytical form.

COMPUTATIONS INVOLVED IN THE CALORIMETER TEST

The following is a detailed illustration of computations for calorimeter tests when the Parr Calorimeter is used. A full explanation of the method involved was set forth in the Journal of Electricity for Dec. 15, 1917.

Let us assume the following experimental data:

Water equivalent of calorimeter.....	135	grams
Weight of water used.....	2000	"
Weight of oil used.....	.3765	"
Per cent moisture in oil.....	.5%	"
Weight of accelerator.....	1500	"
Room temperature	70°	F.
Temperature of mixture when fired, 73.665, F.		

Combustion Period		
1 min.	.....	77.45
2 "	.....	78.15
3 "	.....	78.42
4 "	.....	78.42
5 "	.....	78.45
Radiation Period		
6 min	.....	78.44
7 "	.....	78.42
8 "	.....	78.40
9 "	.....	78.385
10 "	.....	78.370

The Correction for Temperature Readings.—Since from the above it is seen that the temperature falls off from its highest reading, t_h , or 78.45° F. to 78.37° F. in five minutes, it is evident that in one minute it would fall off .016° F. As a consequence at the end of the combustion period, in reality the thermometer should have read greater than t_h or 78.45° F. by an amount equal to the radiation t_r which occurred over the first five minute period. In addition to this correction, by consulting a correction scale furnished by the Bureau of Standards, the thermometer should be corrected for 78.45° F. by an amount equal to t_c or .053° and for the minimum temperature t_m or 73.665° F. by an amount equal to t_e or .043. From the instrument maker there has also been furnished data indicating a correction for the chemicals and wire employed, amounting to t_w or (−0.373). Hence the true maximum temperature t_2 and the true minimum temperature t_1 are ascertained by the formulas:

$$t_2 = t_h + t_c + t_r + t_w \dots\dots\dots (3)$$
$$t_1 = t_m + t_e \dots\dots\dots (4)$$

Substituting in the particular case cited, we have

$$t_2 = 78.450 - .053 + .080 - .373 = 78.104$$
$$t_1 = 73.665 - .043 \qquad \qquad \qquad = 73.622$$

Since an accurate comparison of this calorimeter with the most accurate type of calorimeter known in the laboratory has shown that the heating value per pound of oil is .73 of the total heat liberated, we have

$$H = \frac{.73 W_o}{W_o} (t_2 - t_1) \dots\dots\dots (5)$$

We now have in this instance

$$H = \frac{.73 \times 2135 (78.104 - 73.622)}{.3765} = 18562 \text{ B.t.u. per lb. of oil as fired.}$$

If it is desired to ascertain the heating value of this oil when free from moisture, it is only necessary to divide by the percentage of dry oil in the fuel. Thus if the oil sample contained .50% of moisture we find that the heating value per pound of dry oil would be according to this calorimeter determination 18562 divided by .995 which is 18658 B.t.u.

Higher and Lower Heating Value.—In the operation of the calorimeter the gases produced by the combustion of the sample of oil are cooled down to the temperature of the water in the calorimeter. In the case of carbon which, on igniting with oxygen produces CO₂, this cooling of the gas has no important effect since CO₂ remains a gas at all ordinary temperatures. Hydrogen, on the other hand, on uniting with oxygen forms steam, H₂O, which is condensed to water in the calorimeter as soon as its temperature drops below 212°F., and in condensing gives up its latent heat to the calorimeter. When fuel oil is burned under a boiler the gases are always discharged at a temperature higher than 212° so that the latent heat of steam formed by the combustion of the hydrogen content is not available and cannot be absorbed by the boiler. Hydrogen combines with eight times its weight of oxygen so that for each pound of hydrogen burned nine pounds of water are formed, and as the latent heat of steam is 970 B.t.u. per pound, there are approximately 9 × 970 = 8730 B.t.u., which cannot be recovered unless the gases are cooled below 212°F. Deducting this from 62000 B.t.u., the heating value of one pound of hydrogen determined by a calorimeter, gives 52,270 B.t.u., which is called the **lower heating value** of hydrogen.

Since oil contains a considerable proportion of hydrogen it has a lower heating value as well as the ordinary or higher heating value. If a sample of oil contains 12 per cent of hydrogen, and the higher heating value by calorimeter test is 18562 B.t.u. per pound, then the lower heating value is 18562 − .12 × 8730 = 17515 B.t.u. per pound. In boiler testing work it is the universal custom base calculations on the higher heating value as given by the calorimeter, but the lower heating value is ordinarily used when calculating the efficiencies of gas engines.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

SHOP WINDOW DECORATION FROM THE STANDPOINT OF AN ARTIST

BY MARY F. PATTERSON

(The very practical and attractive things which a person with artistic training might do to your windows is suggested by the following. In view of the fact that many of the larger eastern stores are employing college trained women as window decorators, this valuable article by a woman who is training women on the Pacific Coast in the very principles here suggested should prove of particular interest. The author is Assistant Professor of Household Art in the Department of Home Economics of the University of California.—The Editor.)

Since this subject of "Window Decoration" is rapidly becoming a field of endeavor in which attraction and appeal are strong factors in achieving results from a business standpoint, let us analyze the underlying principles which are involved in creating such an appeal.

These principles are in a large degree artistic, and in any work which comes from the hand of an artist, the first tool employed in its creation is that of "composition" or "arrangement." The elements to be arranged consist in forms and shapes of various sizes, colors and values. In other words, the artist has the task of uniting in a beautiful whole many elements which at first glance seem unrelated and very possibly inharmonious.

Take, for example, a simple landscape in which appear trees, a wide stretch of country with a few farm houses and a distant church tower, and possibly a few human beings. All of these objects are quite dissimilar in form, size, color and attraction.

How may they be harmonized? In a hundred ways!

A good example is seen in this composition of Meindert Hobema, a Dutch painter of somewhere about 1638-1709. The composition is rectangular and horizontal in shape, and a fine example of balance. The bare, slender and windworn trees echo the vertical lines of the frame. At the same time, a triangular wedge is formed by their meeting in the distance, and by this means, in addition to the wedge of lines in the center of the foreground the eye is drawn directly up the avenue or road which leads way back into the heart of the picture to the beautiful church which appears drawn in very small measure to

create a further effect of distance. The appearance of flat level country is obtained by the sky-line being placed very low with a wide expanse of sky above, the illusion of distance being further enhanced by the concentration of dark values in the foreground, against the great space of light sky and clouds as background. The artist has selected only those things which were present in the landscape which helped to make a beautiful picture, and to echo the horizontal and vertical boundaries of his rectangle, adding diagonal lines to create the illusion of perspective and great distance in addition to those elements of size and value mentioned above. The people are just tiny notes of lovely color which add life and that human touch which never fails in its appeal to the beholder. In other words, the artist has juggled with the materials at hand, and has created by his, or her, choice, discrimination and knowledge, a convincing and attractive picture, which makes a strong appeal to any lover of nature, because



The elements which go to make up attraction and appeal are the same for any picture, whether it be your window or an old master

of the truth and reality which has been expressed, and which strikes a responsive chord of sincerity in the heart of the beholder.

"But what," my reader will say, "has all this to do with window decoration?" Just this, a shop window is a framed picture, intended to arrest the attention, to excite by the attractive arrangement of its contents a desire on the part of the pedestrian to become the

owner of some of them. Hence, shall the shop-keeper continue to crowd into his windows a hideous and chaotic mass of samples of every article his store contains, of every conceivable color, size and form, so huddled together that no human eye can rest with satisfaction on any given object, or perceive its possible usefulness in any connection of life? Or, will the clever and astute man of business employ some one who understands psychological, optical, and human appeal, to arrange windows after the manner of an artist, in an orderly and interesting composition?

This brings us back for a moment to the consideration of some of those principles which underlie the work of composition, and which exist also in nature as basic principles.

The first of these principles is order, or plan. A vine has on its stem a succession of leaves growing in pairs opposite one another, or growing in alternate positions on either side of the stem. These leaves also may be small in size at one end of the twig, and may grow steadily larger and larger toward the other end, and this with such regular increase in size as to be practically an arithmetical or geometrical progression.

With such a sense of orderly plan will the artist select from the merchandise he is to arrange, certain objects, which by their size, shape, color or use may be grouped in a harmonious way, enhancing one another by their juxtaposition and orderly placing. The eye is thus able to select without effort individual objects for consideration, without the fatiguing sense of confusion which so often bewilders and discourages the seeking purchaser.

The great Japanese artists, such as Yeisen, Hiroshige and Hokusai were content to express in a composition one single idea, as for example in the accompanying familiar illustration of "Black-birds Flying across a Sunset Sky." It is said so simply. The angular action of the black wings silhouetted against the orange glow of the sky, and the large empty space in the picture into which the birds are speeding give with absolute simplicity the effect of a wide expanse of air and sky.

Space and simplicity, therefore, are essential to any orderly arrangement, and will result in "getting over" to the public the intended advertisement of specific objects for sale.

This is particularly true of practical appliances of a purely utilitarian kind, such as hardware fittings, tools, mechanical devices, and the thousand and one small or large objects used in the installation of electrical apparatus. Just here might be suggested the use of a large beautifully printed card, or several posters, listing a large number of the objects for sale which are not on view in the window, but which may be seen inside for the asking. These posters, by the way, should be beautifully and legibly inscribed, with lettering done by hand, preferably, and reproduced by a photographic or zinc plate process, and printed therefrom in an appealing color, which harmonizes, or contrasts agreeably with the background of the window composition.

And how important the background is, in any arrangement of objects which are intended first of

all, to be seen! It is pretty safe to say that it should be plain, that is, without pattern, and neutral in color so that things varying widely in color and form may be readily silhouetted against it. If the background is very dark, the light objects will stand out against it very clearly, but the dark ones will be lost, and therefore a medium background avails more, since there will then be a chance for both light against dark, and



Space and Simplicity, so effectively used by the great Japanese artists, are effective in your window as well

dark against light, and in the case of metal fixtures, there is always the play of light and dark reflections on polished surfaces, which will add still another note of contrast. This effect may be still further increased by artificial lighting at night, which if judiciously done will add immeasurably to the quality of attraction, with which this article was concerned at the start.

Thus far we have been concerned with purely utilitarian objects which do not appeal to the æsthetic sense in any way. For this reason also the arrangements suggested thus far have been concerned chiefly with the question of attraction by use of contrasted values, that is, darks and lights; by contrasted colors and intensities, such as the bright colored objects (the posters suggested) set against neutral backgrounds; by the grouping of similar forms together, with orderly and symmetrical arrangement; and lastly by the addition of artificial illumination.

One more suggestion might not be amiss here,—and that is the advisability of showing only one object of a kind. Druggists and dry goods merchants and wholesalers frequently make the mistake of displaying box after box of soap, or tooth brushes, tooth brushes, tooth brushes! or boxes and boxes of spools, buttons, and small wares all exactly alike. If the prospective buyer sees just one thing of a kind isolated, or grouped with things akin or in some way related, she will be twice as likely to enter the store to inquire whether more may be had of that kind, and when once beguiled in, who knows what the allurements of well arranged counters and show-cases may bring forth?

Santa Claus, if shown as a window attraction or any kind of an advertisement, should be shown as one only—Santa Claus, by virtue of his traditional and mysterious character, and never, as is too frequently the case in Christmas windows, shown in a succession of gaily colored, cut paper repetitions of himself, which destroy wholly the appeal which he alone, and what he stands for can make alike to little ones, and grown-ups.

A whole new range of possible appeal as well as attraction is opened up by the arrangement of objects, not wholly utilitarian in character, but adding to this quality some claim to beauty of form, color or material.

What a rare chance for composition lies here!

Select, for example, one of the really charming eight sided beveled shapes in electrical coffee pots, which are seen in the market today, of gleaming metal, silver or nickel, perhaps of copper, with its attractive note of color. Show this pot,—and let it be the smallest one your stock can produce—not on a crowded table, set in impossible fashion for a meal, with every type of pot, heater, toaster, or other device the store can show, but set on a pretty breakfast tray, arranged with only the things that are there needed, and with the small sized coffee pot the only electrical device. In the course of the day one person after another will come into the shop to buy a "larger sized pot, round, and of nickel, if you please." And there in your cupboard out of sight are plenty of those larger nickel pots awaiting the eager buyer. Human nature goes by contraries, and invariably wants the thing not offered, and this is true not only of feminine human nature!

With lighting fixtures there is such an infinite number of ways of offering an appeal that it is hardly

possible in the scope of these few lines to attempt more than a few suggestions and warnings.

First of all, don't spoil the suggestion of a room interior in your window by trying to show just as many patterns of wall sconces and piano lamps and desk lights and safety devices as can be squeezed into the space, but be content to show for one week, perhaps, a really graceful and charming arrangement of wall sconce, near a well chosen desk or piece of furniture, with an attractive bit of colored porcelain upon it, and, perhaps, a good chair at the desk, and an attractive low light whose shade contrasts in color and texture with the background which may have a neutral color and an unusual texture upon its surface. This latter consideration of background is important, for with this scheme an astonishing succession of new combinations of color may be gotten by the objects placed against it.

If the arrangements are kept simple, but varied in their type, it is only the work of a few moments to change them and show a new group of fixtures, every few days, and it will prove a far better advertisement of the stock on sale, than do the more elaborate arrangements of many things shown all at once.

In this type of æsthetic appeal variety or contrast in textures plays an almost greater part than color although color and distinguished form are ever desirable and serve as attractions of a most valuable kind.

The use of reflected light, and strongly-directed hidden lights can hardly be over-estimated, as also the many modes of shading light with silk, porcelain, mica, or semi-transparent or translucent glass, which add so much to light efficacy by subtle effects of softened light.

The collage consists of numerous overlapping advertisements. Key elements include:

- Top Left:** "Shop Early—Give Gifts Electrical" with an illustration of a vacuum cleaner.
- Top Center:** "Electrical Gifts Lighten Labor in the Home" featuring a woman sitting at a desk with a lamp.
- Top Right:** "Give Electrical Gifts Shop Early" and "The Poppy Vacuum Cleaner".
- Middle Left:** "GIVE SOMETHING ELECTRICAL THIS CHRISTMAS" with an illustration of a woman using a vacuum cleaner.
- Middle Center:** "GIVE SOMETHING ELECTRICAL THIS CHRISTMAS" with an illustration of a woman sitting at a desk.
- Middle Right:** "Give Something Electrical This Christmas" with an illustration of a woman using a vacuum cleaner.
- Bottom Left:** "The Poppy Vacuum Cleaner" with an illustration of a woman using a vacuum cleaner.
- Bottom Center:** "GIVE SOMETHING ELECTRICAL THIS CHRISTMAS" with an illustration of a woman using a vacuum cleaner.
- Bottom Right:** "Every Electrical Gift Fills a Need" with an illustration of a woman using a vacuum cleaner.

 The Utah Power & Light Co. logo is visible in several of the ads, including the central one and the bottom right one.

HOW A CENTRAL STATION HELPED

Christmas advertising gotten out by the Utah Power and Light Company and published in the Utah papers for a month or so preceding Christmas,

Customer's Comments_____

(The woman is the purchasing agent of the home—for electrical wares as for other things. In this unusual article, a woman customer tells just how she feels about it—how she would like to be treated and what she wants to be told. The author is not a specialist along electrical lines—just an ordinary customer.—The Editor.)

WINDOW SHOPPING is the occupation of the person who doesn't know what he wants. If a man sets out to buy a hammer, he goes to a store with a hardware sign over its door and regardless of whether there is an attractive window display or a well arranged interior, he asks for hammers. To be sure, if there are two stores, other things being equal, he is more apt to go to the one which shows a more up-to-date spirit in windows as indicative of the wide awake attitude elsewhere. But suppose him to be out on an entirely different errand—waiting for a street car say, on a rainy day. He is not thinking of tools at all, but an attractive window catches his eye—he steps into the doorway to examine it. There he sees a tool chest at an especially reasonable price—what he really needs at home, what his boy ought to have. He goes in and asks about it.

This is one of the reasons why, as a customer, electrical window displays have a special interest for me. Electrically speaking, I don't know what I want. Of course, when the lamps burn out too many sockets so that it is no longer possible to borrow one from another floor, I go to the nearest store with a lamp sign and buy some. Further than that I know very little of things electrical. But I am being educated—by the shop windows.

DUST MEANS DEATH—and flies are an abomination in any window, whether the products are edible or not. There is a little electric shop in our neighborhood which has the dirtiest windows of any store in the block. There are fly specks on the panes and dead flies on the faded dusty crinkle paper which is meant to decorate the shelves. Articles for sale scattered everywhere—a litter of odds and ends. They are dusty and fly-specked too—and not in any order. The window looks like the bureau drawer that your small brother couldn't find a clean handkerchief in the morning he was late for school. There is a sign pasted up on one side advertising a Liberty Loan which has been past some several months.

Do you think I would buy anything at that store? I might hire the man to fix the doorbell some time if I couldn't find any one else in the telephone book, but I would never think of buying an electric washing machine there—or a vacuum cleaner. I daresay he carries standard wares—but things don't look quite so useful when they're dusty.

After all, a show window is an advertisement, just as much as a billboard. What that man's window

says to me is "I am careless and dirty. You would never get tasteful things from me because I haven't the taste to pick them out. I am not the sort of man you would enjoy having anything to do with." Of course, this is an extreme case and there are very few windows around town which are quite so bad. But there are a good many which are dusty, and quite a few that are carelessly arranged. I have counted out of date patriotic campaign signs and election cards of candidates who have long since lost in more than one. And every one of those windows gave me a mental picture of the proprietor of the store which was distinctly unflattering. Why have an advertisement if you are going to advertise your bad qualities?

CHANGING WINDOW DISPLAYS is one of the cardinal rules in conducting a department store. I wonder why more electrical dealers don't follow the example? One enterprising little electric store I pass

frequently, changes window displays every week—and I always stop to see what is there. Not only do I get a better idea of the stock of the establishment, and the window itself is kept neater and more attractive, but I am sure there is less loss to the proprietor in the goods displayed. It can't be good for any article to lie about uncovered in the sun for months and I get the impression that the contents

of some window spaces are set down to expenses of the trade. Aside from the actual loss involved, it seems obvious that an object spoiled by its looks for sale isn't a very good advertisement, either.

LABELS ARE THE LIFE of any window. The trouble with me, so far as electrical goods go, is that I am apt to take it for granted that I don't want them. I look upon them as a great luxury. I am not a natural customer for electrical wares and you have not only to show me how attractive the things look but to convince me with selling arguments that I want to buy.

I have an idea electrical appliances are horribly expensive—it is worth while, by your labels, suggesting that they are not. You need not give the price of the individual objects displayed perhaps—make me come in and inquire about that—but suggest that you have electric irons from \$3 to \$15 (I am not quoting actual prices) and that heaters run from \$5 up.

In the second place, my life runs along smoothly with a sad iron for wash day and a Japanese boy to clean the floors. The trouble is that along with most other people, I still regard electrical conveniences as a luxury rather than a necessity—therefore, not for me—and it takes a special selling argument to interest me. You don't have to suggest a special reason to me why I should buy a hammer—if there isn't one in the house, I shall go out and shop for one. But you have to make me think I need an electric heating pad. I

A DOLLAR FOR IDEAS

If you have a particularly good window display or a selling idea, if you have worked out a better way of handling some part of your contracting or dealing business—or if you know some one else who has—send us an account of it and a picture and we will be glad to use the best in these columns and send a dollar to the author. There are hundreds of ideas which you as contractor-dealers are working out today—there are a hundred more which you can think up and put into practice—and send in the Journal of Electricity. If you are not a contractor-dealer yourself write up an idea you have come across in your travels—or suggest an idea to some friend in the business and then get a dollar from the Journal of Electricity for a picture of it.

haven't accepted the idea sufficiently yet to have it occur to me by myself.

BUT THE ELECTRICITY BILL is the stumbling block, after all. There are very few people who do not recognize that the various electric devices are a real convenience. They would be glad to own one—if only some kind friend would pay the cost of operation. So great is the luxury of merely having to press a button, that I doubt if there are many who would hesitate at the original cost of the appliance—the problem of the dealer is to convince the customer that his wares are not too expensive to run. From my standpoint as a customer, I should say that any facts which would show me that it actually cost less to run an electric washing machine than to hire a Swedish girl to do the wash would be the most persuasive of



An effective advertisement by a San Francisco firm

selling arguments. I should appreciate having every object in the store marked in terms of its cost of operation, comparative cost with methods other than electrical—and lastly, its actual price. However, I should want to know that the statements were actual facts.

“THREE CENTS AN HOUR” makes attractive reading on an electric heater, but after a customer has heard the statement in more than one town, I have an idea he begins to wonder as I did whether the electricity rates are the same in both. Most people are skeptics on the subject of how much it costs to run electric devices. The dealer says three cents an hour, but you have an idea he got that out of a book and that it doesn't refer to electricity as priced in your town. There is always someone on your block who has tried it and whose bills “ran 'way up.”

Now I don't know how the cost per hour is figured up—maybe it is gotten out of a price catalogue and maybe it is actually figured out at the rates you will have to pay and the lady down the block is merely careless in running her heater. But the point is that I should know how it is figured out. If the dealer or the wholesaler he buys from has worked out how much it will actually cost in my town, he ought to get the credit for that fact. The more into detail he goes on the subject the better. Personally I should like to see a sign in the window stating that with electricity in Oakville at so much a kilowatt hour, it costs so much to run an electric washing machine for an hour, so much a vacuum cleaner—and so on. The cost per hour should be stated on every label—and stated specifically in local terms.

MOVING THINGS always take my eye. I would stop any time to look in a window and try to figure how things worked. Most of these devices are run by electricity I know, but the ones I can think of now were none of them used to advertise electric wares. One ingenious device was used to call attention to a certain varnish sold by a local hardware dealer. A metal float skated about the surface of a small stand bearing a standard which advertised the varnish. The idea was to show how smooth a surface the varnish made, but I know I stood there fully fifteen minutes trying to figure out how the float was made to move. The moral is that I remember the name of the varnish still—and that I have always considered the store that showed that exhibit a particularly enterprising one. Unconsciously, I think, I gave its owner credit for knowing how that worked when I didn't.

Near my home is a grocery store which has a frame in the window with a little flashing electric light above it which continually winks on and off. Every two or three seconds an advertisement of some food stuff sold in the store appears in the frame, remains for a few flashes of the lamp and then folds down to give place to another. It is simple enough, but I always stop to watch it and to count how many cards it displays and how many seconds they remain.

FOR AN ATTRACTIVE WINDOW

There is an attraction in moving things, particularly in flowing water which draws the spectators. This little electric fountain helped make a florist's window one of the most attractive sights of the city. Why not an electric dealer's window? It is self-contained and needs only an attachment to an ordinary lighting socket to run it.



I think I shall never forget the brands of beans, tamales and grape juice which that store carries.

SHOW WINDOWS COUNT—there is no question about it. Good color schemes, effective arrangement, a moving device—the picture of the window as a whole is what makes me stop in the first place; good judgment in selecting the articles to display, attractive detail and effective signs and labels are what make me buy. As a woman, I have the department store habit—and you have to compete with it. You have a better selection of electrical wares, as a rule you sell things more reasonably, you know more about your product—you can catch me when I come in to see about wiring. I could be persuaded to trade with you—but I have grown accustomed to attractive displays in the store and in the windows and to the atmosphere of a very progressive business. And I judge you by it.

ELECTRICAL INSPECTION

BY E. F. DUNLAP

(With fire pointed out as Germany's greatest ally, the importance of extra care in safeguarding electrical apparatus and installations cannot be overestimated. It is not by the accidents which occur but by those which are prevented that the value of electrical inspection is shown and the fact that Portland has been said to have the best class of installation work in the United States should make this article by the chief electrical inspector of that city one of especial interest. It forms part of a paper read before the Convention of Oregon Contractors and Dealers at Eugene.—The Editor.)

The need of proper electrical inspection may be seen wherever electrical installations exist. One of the difficulties of realizing the value of electrical inspection departments is that the work does not show. It is only when some disaster happens that the inspection department is brought to the front and if the inspector has been negligent the department is held responsible. Little does the public realize the disastrous fires that have been prevented by the locating of and removing of some serious hazard.

The work may properly be divided in three general classes: Inspection of old installations; new installations, and temporary installations. The objectives to be gained by inspection of these three classes are the same but the methods of inspection are vastly different. Two objects are to be attained. One is the elimination so far as possible of fire hazard, and the other, which is equally if not more important, is the elimination of hazard to life.

No new industry is perfect in its infancy. This is true of the electrical industry as well as any other. In its early stages very crude apparatus and materials were used. Who has not seen old buildings that were wired in the early days with No. 16 or even smaller wire with light insulation, sometimes rubber covered wire and sometimes weather proof wire. In a great many of the older installations the wire was tacked directly to the joist or other timbers without any form of insulation being used. Cleats and rosettes were made of wood. The joints were not soldered. Rubber tape was seldom used. Switches were crude affairs but they answered the purpose until something happened.

Open link fuses and fuses in canopies were the original methods of fusing, both of which were exceedingly hazardous.

Old Installations

Let us consider for a moment the inspection of old installations. Our requirements in such cases consist of installing proper cutouts and fuses, soldering and taping of all accessible joints, placing of insulating joints on combination fixtures, covering up the grounded gas pipes and placing of doors on cabinet boxes and cutting off of long cords to proper height. This is all on the supposition that the wires are reasonably well insulated and the installation can be made reasonably safe. If the wires are tacked directly to wood and wooden cleats are used, the installation is at once condemned and service refused. If an installation of this character is found which already has service, it is condemned and ordered disconnected and rewired. A great many old buildings are being rewired each year.

New Work

Inspection of new work is handled on a vastly different basis. Standard materials and apparatus must be furnished and properly installed. While the safety feature is the paramount issue, the requirements of the ordinance must be adhered to. Definite standards of installation have been set, and any lowering of this standard would at once show itself in the quality of work and materials used. The inspection of new work consists largely of checking for quality of wire used, locating unsoldered or untaped joints, improper supporting of wires and improper fusing. However careful a workman may be, he will occasionally overlook a joint, but the wireman who richly deserves the most severe criticism is the one who tapes up a joint without soldering. 99% of such cases are deliberate attempts to slight the work by deceiving the inspector.

Temporary Work

In the inspection of temporary wiring for hoists, compressors, and temporary lighting during the construction of buildings and for decorative lighting and other lighting in connection with conventions, land shows and work of that character, the inspection is not so rigid as in permanent work. During construction work on buildings the temporary work is usually in direct control and under the supervision of the electrician who is installing the permanent work. Proper fusing is insisted upon and joints carrying any considerable amount of current are required to be soldered and properly taped. Supporting of conductors on insulators is not required owing to the shifting nature of the installation. In temporary wiring for conventions, automobile and land shows a much better class of work is insisted upon although of a temporary nature. This work is also in charge of a competent electrician who is continually on duty while current is on the installation. The main line switch is required to be opened when the attendant closes the doors for the night. No accidents or trouble of any kind have ever developed in any of these temporary installations in Portland. New code materials are required to be used.

There is another class of work which has been receiving considerable attention from electrical men of recent years. This refers to the inspection of transmission lines and central and sub-stations. A general set of rules governing this class of work has been formulated known as the "National Electrical Safety Code." Extensive investigation was made about two years ago under the direction of Dr. E. B. Rosa of the U. S. Bureau of Standards, Washington, D. C. It was the intention of Dr. Rosa that the rules should apply at first to the most hazardous installations and later be expanded and adopted on a more general basis. The rules apply principally to service switches, grounding, protection of live current carrying parts, insulating mats, transmission lines, especially aerial lines. Crossing of transmission lines over railways, highways and other overhead lines, received especial attention. These rules are being adopted by public service commissions and used as a basis for rules applying to the territories controlled by said commissions. It is expected that before long the Bureau of Standards will be in a position to test electrical material and apparatus and furnish reports of such tests for general information.

The National Safety Code is a step in the right direction and points to the fact that a universal fixed set of rules and standard system of inspection is the ultimate aim of the ones in charge of the Bureau.

Let us go back for a moment and study the early conditions that led up to the inspection work. Most of the earlier installations were of low voltage from 100 to 110 volts. Some were even lower. There were no high tension transmission lines as at present with their transformers which could break down and impress a high voltage upon the installations. However, due to the defectiveness of materials and installations many fires resulted. Their numbers increased in frequency and destructiveness as the number of installations increased until the insurance companies began to realize the need of inspection, so that many of the hazards could be eliminated and the number of fire losses reduced. Even the earlier installations were a great deal safer than the old-fashioned tallow candle and coal oil lamps. Therefore the use of electricity must be encouraged. This called for a continual improvement in the class of fittings and materials to be used. As the insurance people were the ones most vitally interested, it is natural that they should take the lead in this work. As the result we have the extensive laboratories of the Underwriters located in Chicago. Their object is to examine and test all classes of electrical material and apparatus and to furnish a report of such tests to those most vitally interested. The standard of quality has been gradually raised until it has reached its present high standard of excellence. Reports of these tests are continually made up and sent out to patrons and subscribers in the shape of lists of approved fittings.

In the early inception of electrical inspection, there was nothing to guide the inspector in his work. It was his opinion in regard to safety against the opinions of others. The need of a proper guide was soon recognized and the National Electric Code is the result. These rules must needs be general in their nature as they cover a wide area. No set of rules can be made to apply to all conditions in all localities. Their usefulness largely applied to a few classes of buildings, such as theatres, public buildings, garages, and buildings where inflammable gases exist.

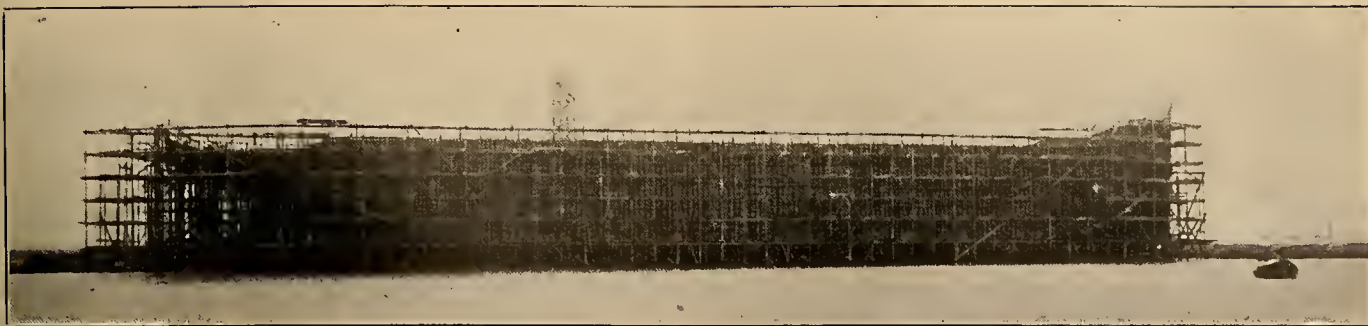
The rules of the National Electric Code were used first by the insurance inspectors but were soon adopted by many of the public service corporations for their own protection and that of their customers. The work of the inspectors of the service companies was limited largely to services, meter loops, and fusing of the circuits, as most of the wiring was concealed without inspection. The insurance companies' inspectors were also doing good work. However, they lacked one very important feature which is necessary before electrical inspection can be a success. If the insurance inspector refused to approve an installation before it was brought up to his standard of requirement, or if he notified the customer that his rate of insurance would be raised unless certain changes were made, he might write his insurance in some competing company who maintained no inspector and was willing to accept the risk. The same might apply to a certain extent to the electrical service companies. It became evident therefore that a vital feature of inspection was lacking. There must be some method used which would be

more positive in its action in securing results. Police powers were necessary to enforce the requests for safety desired by the inspector. This led to the organization of municipal electrical inspection departments. Ordinances were passed and municipal inspectors were appointed.

At first the municipal inspection was done largely by building inspectors, firemen, policemen and others who were in the employ of the city, because the value of inspection by practical electricians was not fully realized. As the hazards in connection with electrical installations become more apparent and the need for proper inspection was more clearly seen, the necessity of having the inspection work done by practical men was realized, and men were chosen for the position through competitive civil service examination.

The old familiar saying that in union there is strength is a very true one, but this might be changed to "In exchange of ideas may harmony of action be obtained." As the result we have such associations as the Western Association of Electrical Inspectors. At the meetings of the association ideas are exchanged, various methods of inspection are discussed and a more uniform system is the result. Unfortunately, we who are so far removed from the meetings of the association must content ourselves with reading the discussions and proceedings of the various conventions and weighing the various ideas presented. The result is a more uniform system of inspection.

There is a vast difference between inspection and criticism. The two are as different as night and day. The duty of the inspector is not to try to pick flaws in the mechanical details of the installation but to determine if there are any defects either electrical or mechanical which would result in either a fire or life hazard, and to point out these hazards that they may be corrected. Neither is it the duty of the inspector to see that the code or ordinance has been merely complied with. There are times when the letter of the code has been complied with and still the installation is not standard. Here is the case where the judgment of a practical, experienced man is required. This is one of the instances where the unscrupulous wireman or contractor does not hesitate to take advantage of the indefiniteness of certain sections of the rules. Let me add, however, that these instances are comparatively rare in Portland. When a real hazard is pointed out very little trouble has been experienced in getting the correction made that is desired. The inspector must hold very closely to the plain wording of the ordinance. He must not let his work be influenced by his own private opinions of what is right or wrong or there will be as many systems as there are inspectors. Herein lies one of the principal duties of the Chief Inspector. His is not an easy task. He must have a thorough knowledge of construction and installation or he will not be in a position to judge when the installation is up to standard. He is the one who is held responsible for the success or failure of the department. If he is capable of filling the position of trust assigned to him he should not be hampered in his work by the opinions and restrictions of those who by lack of practical training along electrical lines are not in a position to direct or even criticise the work being done. This would result in the hampering or possibly complete failure of the department.



CONCRETE SHIP BUILDING SOMEWHERE IN THE WEST

Reports of a concrete ship which is to help defy the attacks of submarines have been looked upon in many quarters as baseless rumors, but here is the vessel in actual construction. The concrete motor boat has already proven a success in the east—the concrete freighter is to be the contribution of the west. The vessel is to be

launched early in January and by April is expected to sail for Japan with a full cargo. The advantages of the concrete vessel are said to be its greater strength and the fact that the forms may be retained and new concrete poured to form a second vessel within a short period.

NATIONAL ELECTRICAL CODE—MARINE WORK

(With the renewed ship building activities of this year, electrical contractors are being called upon for marine wiring as well as for work on shore. This work comes under special rulings depending on the type of ship and the country for whom it is destined. Among others, the National Electrical Code's requirements on marine work are used to considerable extent in the United States. The 1915 provisions for ship wiring under this Code are here given. All wiring, apparatus, etc., not specifically covered by rules herein given must conform to the general requirements of the Code.—The Editor.)

1. Generators

- a. Must be located in a dry place and provided with protecting hand rails.
- b. Must be provided with a name plate giving the maker's name, the capacity in volts, amperes and kilowatts, the normal speed in revolutions per minute, and whether shunt, series or compound.
- c. Generators on storage batteries employed for auxiliary (emergency) lighting or power must be located as far above the load water line as practicable.

2. Wires

- a. Must, except around generators, at switchboards and in wire tunnels, be enclosed in approved metal moulding or metal conduits, unless covered with approved metal armor or metallic braid.
- b. Must conform to the requirements of Nos. 49 and 50. All conductors larger than No. 12 B. & S. gage must be stranded. Except in fixture wiring, no single conductor smaller than No. 14 B. & S. gage shall be employed.
- c. Except at fixtures, conductors must not be spliced, unless under special permission in writing given in advance.
- d. Except at fixtures, and as provided in the preceding paragraph, splices and taps shall be made by means of approved connection blocks enclosed in approved fittings. These fittings shall be located in readily accessible places and will not be permitted in bunkers.
- e. Must be led through metallic stuffing tubes where passing through water-tight bulkheads and through all decks, deck tubes being extended to a height of eighteen inches above the surface of the deck.
- f. Must not be drawn in until all mechanical work on the vessel has been, as far as possible, completed.

Pull boxes shall be installed at sufficient intervals to permit of the drawing in of conductors without

undue strain. These pull boxes shall be provided with gasketed water-tight covers the length of the opening in the box to be at least ten times the diameter of the largest conductor contained therein.

g. Must, when enclosed in metal moulding, flexible metal conduit, metal armor or metallic braid, be provided with additional mechanical protection where passing through coal bunkers and where otherwise exposed to severe mechanical injury.

h. Where metallic braid cable passes through beams or non-water-tight bulkheads it must be protected from abrasion. All sharp bends in such cable must be avoided.

4. Portable Conductors

Must be made of two or more stranded conductors, each having a carrying capacity equivalent to No. 14 B. & S. gage or larger and each provided with an approved insulation and covering. (See No. 51 d, type PWp.)

5. Bell or Other Signaling Wires

- a. Must be of not less than No. 16 B. & S. gage and must not be run in the same conduit, moulding or armor with light or power wires.
- b. Must, if operated at a potential of over 25 volts or connected without specially approved transforming devices to a source of supply of over 25 volts, conform to the requirements of Class "C" and No. 19 a, except that No. 16 B. & S. gage conductors insulated as specified in No. 55, may be employed.
- c. Where radio systems are employed, all permanent wiring in the radio room and above the top metal deck must be magnetically shielded. Any protection placed around antennae leads to prevent ready access to same must be of metal, permanently and effectually grounded.

Note.—It is strongly recommended that all metal work above the top metal deck be permanently and effectually grounded.

6. Switchboards

- a. Must be made of approved non-combustible, non-absorptive insulating material.
- b. Must be kept free from moisture and so located as to be accessible from all sides.
- c. Must have a main switch, automatic cutout and ammeter for each generator and at least one voltmeter and one ground detector.
- d. Each circuit leading from the board must be protected by a cut-out and controlled by a switch.

7. Cut-Outs and Switches

(For construction rules, see Nos. 65 and 67.)

a. Must, except on switchboards and in living spaces, be enclosed in moisture-proof cases. Must be arranged to break all poles of the circuit and must not be located in bunkers or other inaccessible places.

b. Must be so arranged that each freight compartment may be separately protected and controlled.

c. Must be enclosed in metal cabinets when located elsewhere than on switchboards.

d. Must, except for motors, searchlights and diving lamps, be so placed that no group of lamps or other current-consuming devices requiring more than 660 watts, shall be dependent upon one cut-out.

8. Removable Fittings

In vessels having any space allotted alternately to passengers and cargo, the fixtures and wiring in such space shall be so designed as to be removable and the points of disconnection so arranged that they can be properly insulated and covered up. Main fuses and switches shall not be located within these spaces.

9. Signal Lights

a. Must be provided with approved telltale board, located preferably in pilot house which will immediately indicate a burned-out lamp. Each side of all signal circuits shall be carried through the telltale board, and fused at this point.

b. Signal circuits shall in no case supply other than pilot house and signal lights.

10. Motors

Must each be provided with a name plate giving the maker's name, the capacity in volts, amperes and kilowatts, and the normal speed in revolutions per minute.

11. Insulation Resistance

The wiring in any vessel must comply with the requirements of No. 86.

Note.—It is strongly urged that a complete test of the insulation of the entire electrical equipment be made at least once a year.

FACTORS THAT DETERMINE THE SUCCESS OF THE CONTRACTOR-DEALER

BY W. M. DEMING

To have a definite policy and adhere strictly to it in the conduct of your business is of prime importance. The successful business organization of today will be found to be keenly alive to every opportunity for increasing or improving its business.

Many failures result solely from lack of proper conservation of resources. For instance, what possible benefit can be derived from selling material to a firm or individual of shaky or doubtful credit without first taking steps to insure your receiving payment; or, what is gained by taking a contract that you are not absolutely certain will return you a fair profit? Again, it has been found that contractors and dealers in some sections of the country have sold indoor wiring devices considerably under the manufacturer's current quotations at wholesale. The wise and successful dealer will always base his selling prices on the prevailing cost to him at the time of sale. A warning was recently issued by prominent bankers in the East to the wholesale trade in general to watch the inventory accounts of debtors owing to the uncertainty of future prices. Present-day stocks may depreciate over night

in value should any untoward event cause the market to take a sudden slump and this might place both the creditor and debtor in a very unfortunate position. The question of protection against severe shrinkage in assets when the market drops—as it must some time—although no one can at present forecast when it will do so—should receive serious consideration.

E. N. Hurley, now chairman of the shipping board, made an exhaustive study of trade conditions when connected with the Federal Trade Commission. He states that 40% of merchants estimate their costs and 50% price their goods without any definite system—frequently using competitors' prices without regard to their own costs.

Your percentage of overhead and other expenses is determined on the basis of your volume of business which is your selling price. Hence your profit on material and labor should also be figured on the same basis to prevent loss. Failure to allow for overhead and other fixed expenses in determining the selling price has proved the downfall of many.

Referring again to the subject of credits and collections: It is important not only that your bills be sent out promptly but if not paid when due the reason for such failure to pay ascertained and—if unsatisfactory—prompt steps taken to collect. I believe this wins the respect of the customer. All too frequently the contractor-dealer is placed in the position of the grocer. Two ladies during tea table gossip drifted into discussion of the relative merits or possibly shortcomings of their better halves. One asked the other, "Does your husband worry over the grocery bill?" The other replied, "No, he thinks there is no sense in both he and the grocer worrying over it." Doubtless you have met with this same viewpoint in your own dealings.

A UNIVERSITY INVESTIGATION OF WASHING MACHINES

The Household Economics Department of the University of California is planning next term to conduct an investigation into the economics of laundry methods as practiced in Berkeley families with a view to testing the merits of the electric washing machine in comparison with other practices.

The cost of sending out wash to wet, dry and regular laundries, the cost of the wash woman or Japanese boy who does the wash in the home and the cost of an electric washing machine are all to be tested out and statistics compiled. The effect on the clothes and the general satisfaction expressed are further to be taken into consideration.

A similar survey made by Columbia University students in New York City established the superiority of the electric washing machine for that locality. The possibility of supervising just what soap or bleaching extracts shall or shall not be used on the clothes, the absence of rubbing and the consequent longer duration of materials, as well as the satisfaction of not having to bother with outside helps were all brought out by the testimony of the users. The actual cost of operation in comparison with laundries and with women hired by the hour was demonstrated to be less. Whether the investigation in the West will show such favorable results for electric washing machines in competition with oriental labor remains to be proven.

STANDARDIZATION RIGHTFULLY APPLIED

BY W. O. VICKERY

(This country has done much toward the standardization of industry. American railroads can exchange freight cars on their tracks which are of standard gauge; a householder can carry his standard electric lamp from New York to San Francisco and use it in the sockets of his new residence. But much remains to be done. A safe course between overstandardization and lack of it is pointed out in this suggestive article directed to the whole electrical industry. The author is connected with the Trinidad Gas, Electric Railway and Traction Company.—The Editor.)

Standardization in the past has been the means of decreasing cost and has been the means of increasing cost, but if we fully consider it from every angle and apply it to all lines of business, there is no question but that it will bring about certain results heretofore not obtained. It means, to a certain extent, conservation of natural resources. It means more or less satisfaction to the public in general when applied to our public utilities. It means that there will be certain numbers of special kinds of apparatus manufactured, marketed and put in operation which will be of the same kind and make, thereby enabling the central stations, jobbers, electrical contractors and others to carry in stock parts, etc., which can be sold at a reasonable cost. It means that communities will be organized and conducted along certain lines, and when we once familiarize ourselves with conditions there existing and know the regulations pertaining thereto, it is a guarantee that we may expect certain things dealt with accordingly, and we must in return deal accordingly with those we come in contact with.

When I speak of losses resulting from lack of standardization, I might here cite you a few facts which have come into my personal experience. In the first place, just take our generating stations and go back for a few years. We will purchase and install a certain type of machine, operate it for a matter of a year or eighteen months, and then discover that our neighbor over in the next town or city has a machine more up-to-date, more efficient, more reliable and giving altogether better results. Maybe this later machine costs less than the one we actually purchased, which, being the case, it appears that we should discard our present equipment and purchase the later type, but maybe upon complete and detailed investigation, the later type machine may not embody so many improvements as first appeared. At any rate, the reduced cost of this later machine, which is selling for less money than the original machine, is evidence that the manufacturer sold to his customer the experimental or some of the first machines not complete in their design.

Far be it from the writer to say that we should stand by any particular method in machine design along lines of business, for in so doing, we would not in any wise progress in this progressive age; but it is the writer's opinion that at the present day we are either advancing at too rapid a rate or else we are

paying the manufacturers the developing cost of the newer type apparatus.

At any rate, it leads us to that one goal, which is standardization. The writer does not mean to say that in standardizing we should follow out one prescribed course along business lines, that we should use one particular type of apparatus, that we should do anything, in fact, with exact regularity, but we should have a standard way in which to do this thing which would apply to most any and all kinds of business and any and all kinds of apparatus, or, at least, that should aim to bring about such results.

Now, as an example as to what the writer has reference to, take, for instance, our present electric rates. The method of charging should be based all along the same lines. This does not mean that we

should have the same rate for each and every city or locality, for reason of the difference in the cost of fuel and labor; but it does mean that we should have a standard method of applying such rates. Supposing that we were to charge on a minimum basis and for a

should have the same rate for each and every city or locality, for reason of the difference in the cost of fuel and labor; but it does mean that we should have a standard method of applying such rates. Supposing that we were to charge on a minimum basis and for a minimum charge. Would it not be better to standardize, either on a flat service charge basis or standardize on a minimum charge basis or on some other basis? At any rate, if the method of charging was the same, it would not require any great length of time to educate the public as to the reasons for such charges at the present time.

As a fair example of where standardization is not rightfully applied, we will assume that we have bought for a central station a certain amount of machinery, switchboard and instruments, which we operate for a matter of two or three years, or maybe less. At the end of that time certain repair parts are necessary. Upon going to the factory they advise us, in some cases, that this type of apparatus has become obsolete and they are no longer manufactured.

To understandingly apply standardization means that we should keep in consideration the present day type of apparatus, machines, etc., already on the market, and, in figuring out requirements, installations, etc., we should not require the manufacture of any special type of apparatus, but should rather endeavor to apply standard types already being manufactured to the business at hand. The time was and the time is yet in some cases, when we imagine that we must have special apparatus and appliances to fulfill certain requirements. The manufacturers are today making more effort towards understandingly applying standardization than the central station man, and misfits, errors and dissatisfaction in a number of cases are caused more or less by the central station or the customer asking for special rather than standardized methods.

IF THEY BUT WOULD—
THE MANUFACTURER might cease to experiment on the consumer and standardize his product,
THE CONTRACTOR might stop asking for special apparatus and apply standard types,
THE CENTRAL STATION might fix its rates upon a standard basis,
whereupon—
THE PUBLIC would cease to regard charges for things electrical as matters of guesswork.

Technical Hints

BY GEORGE A. SCHNEIDER

(The contractor-dealer is in a peculiarly favorable position because as a contractor he can make business for himself as a dealer, and as a dealer he is continually providing necessity for his services in the contracting line. It behooves him to take full advantage of this by way of better service to his customers. That electrical wars have not deteriorated with the war is a selling argument that may not have occurred to many dealers—but the contrast with conditions in other trades should appeal to the purchaser. The advantages and disadvantages of automatic cutouts for storage batteries are further considered. The author has recently gone East to take charge of the Buffalo office of the Western Electric Company.—The Editor.)

AUTOMATIC CUTOUTS FOR STORAGE BATTERY CHARGING EQUIPMENTS

A question which is brought up quite frequently in connection with storage battery installations is that concerning the most suitable device or satisfactory means of interrupting the charging circuit automatically when the battery becomes fully charged. In some cases devices are required for the purpose of automatically starting the charge as well as stopping it at the proper time.

Before discussing the various methods which may be used, let us note the ways in which the fully charged condition of a battery can be determined. For the purpose of this article, these may be classified as follows:

- (a) By the specific gravity of the electrolyte.
- (b) By the final charging voltage.
- (c) By the color of the battery plates, when observable.
- (d) By an ampere-hour meter.

Of the various means here outlined, the specific gravity is the only absolutely reliable indication of the true condition of the battery and should always be taken as the final check. The value of the gravity for the fully charged condition should be that recommended by the manufacturer for the particular type and size of battery as this factor will vary over a considerable range. For example, the gravity which might be correct for a vehicle battery would probably not be satisfactory for a stationary type battery of about the same capacity. The color of the plates will serve only as a rough indication and then only when judged by an experienced person.

The final charging voltage is also a fairly reliable factor for determining when the battery is fully charged. It should be noted carefully, however, that the test to determine when a battery is fully charged is not to ascertain that it has reached a certain voltage but to determine when it has reached a maximum voltage. For a lead type battery the maximum voltage will vary from 2.4 to 2.8 volts per cell. It will depend upon the type of cell, age of plates, temperature of electrolyte, gravity of electrolyte, etc. as further noted below. The ampere-hour meter is a convenient instrument for recording the condition of the battery and in conjunction with other apparatus can be arranged to interrupt the charging circuit when the battery is completely charged. It cannot, however, give absolute reliable indications for reasons to be explained later.

There are three general types of cutouts on the market, two of which depend upon factors which indi-

cate charged conditions as already noted. The three types are:

- (a) Voltage cutouts.
- (b) Ampere-hour cutouts.
- (c) Time switch cutouts.

A voltage cutout is one which will operate when the battery voltage has risen to a certain predetermined value. It generally consists of a circuit breaker, with a voltage coil connected directly across the battery terminals, so designed that it will trip out at this certain voltage. It is a simple, inexpensive device and would be very satisfactory were it not for two more or less variable factors which must be considered: first, variable battery voltage; second, variable line or supply voltage. This latter factor need be considered only in connection with rectifiers or similar devices in which the charging voltage varies with the supply voltage. In motor-generator sets the generator voltage is practically independent of the supply voltage and this second factor need not be considered.

As already noted, variable battery voltage may be due to a number of causes. If the temperature of the battery is high, the voltage will be low. Conversely, low temperature means high battery voltage. Likewise, high density of the electrolyte causes high voltage and conversely low density, low voltage. Again, low voltage may be caused by one or more cells being short-circuited, either wholly or partially.

Because of these many variable factors there is a possibility of a voltage cutout interrupting the charging circuit before the battery is fully charged. Also if the line voltage is abnormally high or the battery voltage low, the battery may be overcharged and likewise overheated, which if continued from time to time would be likely to injure the plates. So in general, voltage cutouts are not a complete success and are not to be recommended except under special conditions.

The ampere-hour cutout equipment consists of an ampere-hour meter having auxiliary circuit-closing contacts and a shunt-trip circuit breaker or equivalent device. When the hand of the meter reaches a certain position or has moved through a certain distance, these contacts are closed, thus tripping the breaker and interrupting the charging circuit. The adjustments in the meter are so made that the charging of the battery will be stopped when the number of ampere-hours delivered to the battery from the charging circuit is equal to the previous discharge in ampere-hours plus the internal losses in the battery, measured in ampere hours. This compensation for the internal losses in the battery is made by adjusting the meter to run slower on charge than on discharge. The difference in the two speeds is about 15 per cent; that is, the speed on charge is about 15 per cent slower than the speed on discharge. This is based upon an ampere-hour efficiency of 85 per cent which is a fair average for a small battery.

Due to the fact that the battery may be charged and discharged at different rates from time to time, the ampere-hour meter will not always record with the same degree of accuracy, and to insure the battery receiving a full charge, it will be necessary to give the battery an occasional overcharge even though the ampere-hour meter indicates a fully charged condition.

The need for overcharge will be indicated by a gradual reduction in the final charging voltage or specific gravity. Generally speaking, the ampere-hour meter will give quite satisfactory service if the voltage and gravity is checked carefully, from time to time.

The time switch is a useful and reliable form of cutout for batteries when the amount of energy taken from the battery remains about the same from day to day, or can be estimated for each discharge period, as could be done, for instance, in an electrical vehicle, by keeping a record of the mileage. After a little experience, the operator will have no difficulty in setting the switch to give the right amount of charge. The time switch cutout has one advantage over the other forms; it is not affected by variable battery or line voltage. It is also positive in operation if kept wound.

THE QUALITY OF ELECTRICAL APPARATUS

Due to the abnormal conditions imposed by the war, the quality of the products turned out by many factories is somewhat inferior to the standards of several years ago. In some cases this has been caused by the desire of the manufacturer to produce a cheaper article to offset the increasing cost of the finished product and in others by the inability to secure a sufficient supply of raw materials of the right quality or kind. This condition has required the use of substitutes or demanded changes in the manufacturing processes, all of which tend to lower the quality of the final product, especially when the changes must be made quickly in order to supply the abnormal demands such as many factories have been called upon to meet during the past two years.

This very condition of affairs is found to exist in connection with many industries—in fact more of them are affected than one would offhand imagine.

A little study of the question will, however, bring out some surprising facts and show the far-reaching effect of the war on manufacturing industries. For example, the seamstress complains that it is now almost impossible to get good thread, and that the needles are inferior in quality; the shoe clerk admits that the leather products are not up to the regular standards; the dentist comments on the supplies which he needs because they are not up to standard; the dry goods merchant will guarantee but very few lines of fabrics against fading and the haberdasher will have a much similar story. And so it is with many of our needs for existence—whether luxuries or necessities.

These changes have not been due to an effort to keep prices to the original level, but have taken place generally in spite of a rise in price, which in some cases has been almost doubled. Government demands and the impossibility of obtaining raw materials are the usual explanations offered the public.

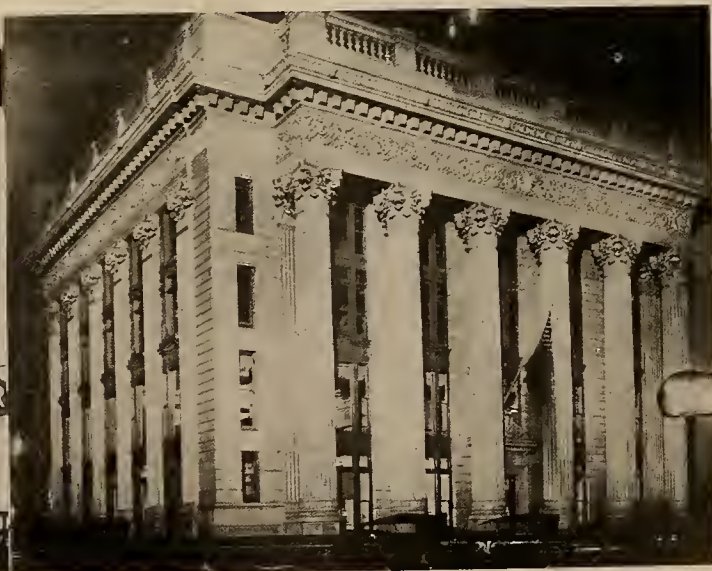
While the manufacturers of electrical apparatus and supplies have experienced their share of troubles, there has been no noticeable change in the quality of the product. As a general thing the quality has been well maintained and in some instances due to better methods of manufacture—some of which have been brought about by necessity—the product has actually been improved or an equally good product has been turned out at about the same cost.

This condition of affairs should be appreciated by the electrical merchant and he should make capital of it at every opportunity in presenting his lines to his customers. It should give him considerable pride to be able to explain that while the price of most devices or appliances has increased, the quality is still of the best. In this respect, the electrical merchant is in a most favorable position. How many of them are taking advantage of it?



TEN O'CLOCK — MORNING

An example of the type of business which may be picked up by the enterprising contractor-dealer is to be found in these daylight and night views of the U. S. National Bank of Portland, Oregon. Twelve X-ray flood lighting projectors are used for the night illumination. They are banked together in three horizontal rows of four projectors each, mounted one row above the other on an iron framework installed on the



TEN O'CLOCK — NIGHT

top of a four-story building which stands on the diagonally opposite corner of the street intersection. The projectors are grouped together as much as possible with the idea of producing a forenoon sunlight effect, thereby preserving the architectural features instead of obliterating them as is done in many flood lighting installations. The equipment consists of six 500-watt lamps and six 750-watt lamps.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(If the Patent Office once grants you a patent, how is it that a man may later sue you for infringement of his previous patent when you come to manufacture your product? Just the scope of the rights granted are here pointed out, together with a consideration of exactly what you may claim for your inventive idea. The report of a recent court decision on electromagnets illustrates the procedure. The authors of this excellent article are prominent patent attorneys in San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Importance of Securing Both Broad and Narrow Claims

It is also important for the inventor to appreciate the value of securing an allowance of not only broad claims but also narrow claims covering his preferred form of embodiment of his invention. Narrow claims are limited to and include features not called for by the broad claims. It is, therefore, much easier to anticipate a broad claim or, in other words, find in the prior art, a disclosure of every feature called for by such broad claim. Even though such prior art disclosure contains every feature mentioned in the broad claim, it may not contain the additional features included in the narrower claims and, therefore, will not be an anticipation of such narrower claims. Of course, the subject matter of a claim is not novel, if all the features of such subject-matter are found disclosed and described in some prior patent or publication. When the subject-matter of a claim is so found in a prior patent or publication, said prior patent or publication is called an anticipation of the claim and invalidates the claim for lack of novelty.

Issuance of Patent

The prosecution of an application continues until all of the claims, remaining in the application, have been allowed and thereupon the application, as a whole, is allowed. Within six months after the allowance of the application, the government issuance fee of \$20.00 must be paid to the Patent Office. The letters patent are issued about three weeks after the payment of such fee, usually termed the "final fee."

Question of Infringement not Considered by Patent Office

In passing on an application, the Patent Office does not consider the question of infringement,—that is, whether or not the manufacture, sale or use of the device, disclosed in the application, will constitute an infringement of some prior patent. The prior patents are examined for the purpose of ascertaining whether or not the subject matter of the application is novel,—that is, whether or not it is disclosed in such prior patents.

Examples Illustrating Some Elementary Principles of Patent Law

By reference to the assumed development or evolution of such a simple "idea of means" as is embodied or concretely expressed in a chair, we shall now illustrate a few of the elementary principles of patent law. It is to be understood that our illustrations are not intended as correct examples of any patent law principle other than those specifically mentioned in connection therewith. Questions of general patentability,

invention, aggregation, double use, etc., etc., are not taken into account in giving such illustrations.

Generic Idea of Means

Let us assume that chairs had never been provided with casters on the legs thereof and that one Jones, was the first in the art to conceive the idea of combining any type of chairs with any type of casters. Such a conception would be a broad, generic abstract idea of means or generic invention. In applying for a patent on said invention, it would be impossible for Jones to illustrate, in his application, all kinds and types of casters and all kinds and types of chairs, yet his "idea of means" is sufficiently comprehensive to embrace the combination of every type of chair with every type of caster and, therefore, he would be entitled to a patent covering the combination of any type of chair with any type of caster.

Best or Preferred Form of Embodiment of Idea of Means

To secure a patent covering broadly his generic invention, Jones would be compelled to comply with the law and disclose, in his application, the preferred or best form of embodiment of his broad invention. Such preferred form would necessarily be only one specific embodiment or **species** of the **generic** invention. Let us assume Jones selects an **arm chair** combined with casters as the best or preferred form in which to embody or express his idea of means.

In his application drawings, he would illustrate an arm chair provided with casters and, in the specification forming a part of the application, he would describe such arm chair with casters on the legs thereof.

Generic and Specific Claims

Being the first in the art to combine any type of chair with any type of caster, Jones would be entitled to a generic "**claim**" as broad as his novel combination.

Being the first in the art to combine an arm chair with any type of caster, Jones would be entitled to a specific "**claim**" limited to such specific combination.

a. **Generic Claim:** In combination, a chair and casters attached to the legs thereof.

b. **Specific Claim:** In combination, a chair, arms arranged above and at the sides of the seat thereof and casters attached to the legs thereof.

DECISION

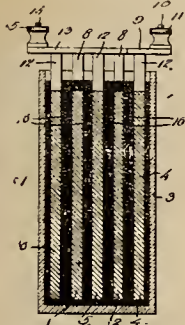
The Sundh Electric Co. brought suit against the Cutler-Hammer Mfg. Co. and the General Electric Co. charging infringement of the Lindquist patents Nos. 744,773 and 764,608, covering electromagnets. The object of the Lindquist inventions was to provide an alternating current electromagnet in which the armature was held in place by a substantially constant

pull, whereby chattering was eliminated. This was accomplished by the symmetrical disposition of a plurality of coils, parallel to and surrounding the axis of the cylindrical core. The patents show the coils arranged in geometrical symmetry about the central core, but the complainant urged that the patent was not limited to geometrical symmetry but should be read to include magnetic symmetry, although no mention was made in the patents of magnetic symmetry. The electromagnets of the defendants embraced magnetic symmetry, but not geometrical symmetry. The Circuit Court of Appeals, in its decision, holds that the patents must be construed to refer, and be limited to, physical or geometrical symmetry and not to a theoretical magnetic symmetry and that the defendants had not infringed the patents. In this case, the complainants, with the aid of the electric experts, attempted to read into the patent something which was not there, in order to prove infringement, but the Court refused to consider that the geometrical symmetry disclosed in the patent should be considered as magnetic symmetry. The experts defined magnetic symmetry as such a distribution of the magnetic fluxes in the polar faces which are in contact when the magnet is energized, as will provide out-of-step pulls, the resultant of which never disappears and is substantially constant in direction and point of application.

NEW PATENTS ISSUED TO WESTERN INVENTORS

Improvement in Accumulator Cells

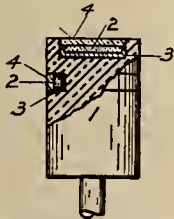
Patent No. 1,246,595 has been issued to Harry S. Hawkins of Alturas, California, for an improvement in accumulator



cells. The object of the invention is to provide a cell in which the electrode plates are rigidly held in place by a supporting means which contacts with them at a plurality of points.

Illuminated Switch Button

Patent No. 1,246,080, issued to Maxwell C. Frank of Piedmont, California, shows an illuminated switch button. This is a different form of illuminated button from that described in a previous issue of the Journal, although it is for

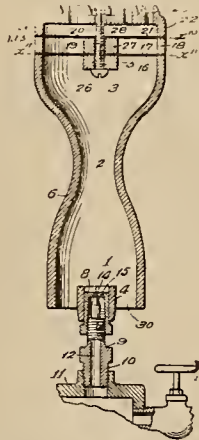


the same purpose. The invention in the present case consists in embedding a layer of luminous material and a transparent covering face in the material of the button so that they form a part of the button.

Non-flash Gas Burner

Patent No. 1, 246, 682, issued to Alfred H. Thompson, of Venice, California, discloses an adjustable non-flash gas burner

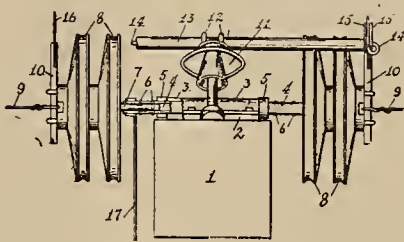
of novel construction. The burner consists of a vertical venturi tube having an air inlet and a gas inlet at the lower end. The upper end of the venturi tube is divided into two mixing



chambers by transverse screens, which act to prevent back firing. The upper end of the tube is provided with a heavy heat-resisting free burner tip.

High Tension Line Switch

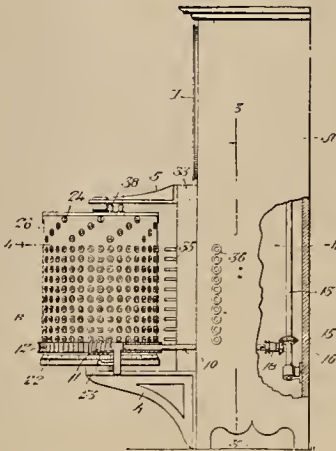
Patent No. 1,246,303, issued to Earle A. Muckey, of San Francisco, California, discloses a high tension line switch. This switch comprises a rotatable shaft having an insulator disc on each end and a conducting arm arranged diametrically



on the outer face of each disc and the line wires are attached to these arms. Arranged to one side of the shaft is a fixed conductor provided with contact clips into which the arms are moved to close the circuit when the shaft is rotated.

Electric Annunciating System

Patent No. 1,245,485, issued to David L. Martyn of North Yakima, Washington, shows an electric annunciating system. The device is particularly designed for a call system for hotels and comprises a rotating drum having rows of apertures therein corresponding in position to definite times. A contact



finger is arranged in the plane of each row. The drum is rotated by a clock mechanism and the apertures in any one row pass the contact finger at certain fixed times.

SPARKS—Current Facts, Figures and Fancy

(The ability to find substitutes for articles threatened with scarcity is one of the major helps to winning a war. For this reason the substitute for rubber which has been worked out at the University of California is a contribution of particular value. War and post-war conditions here and elsewhere are further taken up, together with mention of odd inventions and recent happenings which should be of interest to electrical men.—The Editor.)

Electrocuting the mosquito is a new use for electricity in the home. An ingenious engineer has rigged up a system of double screening for his windows and connected these up with a battery, so that any insect crawling from one to the other succeeds effectively in electrocuting himself.

* * *

According to recent data collected by the U. S. Department of Agriculture, the average net depreciation of a horse is \$4.50 per year. As these figures include colts as well, the depreciation of an adult horse would run considerably larger, about \$12.50 per head. The death loss was about 1 out of every 51.

* * *

A substitute for rubber in its various applications to war needs has been worked out by Professors Hall and Goodspeed of the Botany Department of the University of California, using rabbit brush as a base. It is hoped also that it will be possible to obtain a like material from other of the plants native to California.

* * *

The Red Cross Christmas Candle suggestion was withdrawn at the instigation of the National Board of Fire Underwriters—with the recommendation that an electric flashlight be used in its place. With an electrically lighted Christmas tree and the electric beacon in the window, this was indeed an electrical safety first Christmas.

* * *

An artificial wave was used to float coal barges down the Ohio River at the low stage. By releasing stored waters on tributary streams at carefully timed intervals, an artificial flood wave was created which carried the barges safely to their destination. The idea might be applied to the dry period of some of our western streams.

* * *

The electrical business is growing five times as fast as the gas business according to the Gas Age. During the five years ending in 1914, the value of electrical products increased from 221 to 335 millions, or at the rate of something over two million per year. A year ago the rate of increase of central station income was about fifty-four million per year.

* * *

Practical results of the food conservation campaign are shown in the garbage reports for July from cities in the United States, just received by the Food Administration. San Diego, Cal., shows the greatest increase in saving, the total collections for July, 1917, reaching only forty-three per cent of those for July, 1916. The efficiency of any concern is tested by its waste products.

If a boy has never taken a clock apart as a matter of interest, he will never become a successful mechanical engineer, according to Sanford A. Moss who has studied into the question of the indications of a natural aptitude for mechanical engineering. He suggests that the first or second year of the college course be planned to include such subjects as will test the abilities and inclinations of the student who has elected this career.

* * *

In Russia you are lucky if you can secure a berth on your train at four times the scheduled price, tickets being bought up by speculators and resold. One traveler reports arriving at the station in good time for his train only to find that it had started three hours earlier. Two very helpful suggestions were then made, that he might stand all night in the corridor or guard's van of another train or return to his hotel and wait until the next day, when he might perhaps have better luck.

* * *

According to the Reports of the State Railway and Warehouse Commission, the coal consumption at the present time by the steam railroads of the State of Illinois is 11,620,000 tons. If the transportation business were operated electrically, assuming the coal consumption was three pounds per kilowatt-hour, there would be a saving of 7,500,000 tons of coal or about 15 per cent of the total coal production of the state of Illinois.

* * *

Provision is already being made for postwar trade between the United States and France. Metallurgy, paper making, and electro-chemical industries are expected to prosper particularly in the Rochelle district of France with the coming of peace, on account of the abundance of cheap power and electrical current available. It is planned to establish at Grenoble a large laboratory where application can be made, under factory conditions and under the direction of the professors of the University of Grenoble, of newly patented processes before their industrial exploitation.

* * *

One effect of the war in England is seen in the fact that it is almost impossible to get a telephone installed in an English home or office in less than six months to a year. The department is unable to find men to do the work. One curious result of this condition is the difficulty which people encounter when they propose to change their business locations or residences. A person who wants to move first finds out if there is a telephone in his proposed new location, and if there is not he does not move.

PERSONALS



E. W. Rice Jr., president of the General Electric Company, New York, has returned to the United States from Japan and passed through San Francisco recently. Mr. Rice brought with him one of the highest decorations ever conferred on a foreigner by the Japanese Emperor. The third order of merit of the rising sun, with the middle cordon, was conferred on Mr. Rice for the consideration his company has shown Japanese electrical engineers both in the United States and in Japan, where the company has two large plants in operation. Mr. Rice went

to the Orient to witness the marriage of his daughter, Miss Mabel Rice, to P. W. Parker, assistant manager of the Standard Oil Company at Manila. Men of the electrical industry are welcoming his sojourn in the West and are extending to him the cordial respect and admiration so deserved through the high service he is rendering to the nation at this critical period.

George A. Ferguson has been appointed Auditor of Western States Gas & Electric Company, Richmond, California, division.

Paul V. Quick, electrical specialist for Landers, Frary & Clark, has returned to San Francisco after an extended trip through the northwest.

W. H. Gribble, manager of the Electrical Specialties Co., has returned to San Francisco from the East and is now visiting the Pacific Northwest.

L. H. Kistler has been appointed electrical engineer for the Northern California Power Company, San Francisco, succeeding R. E. Frickey, resigned.

H. T. Gille, sales manager of the Puget Sound Traction, Light & Power Company, Seattle, Wash., is making a business trip to many of the eastern cities.

G. H. Walbridge has resigned as president of the Colorado Power Company, and L. P. Hammond, former vice-president of the company, is to fill this position.

O. B. Willcox of Bonbright and Company has been elected vice-president of the Colorado Power Company to fill a vacancy left by the promotion of L. P. Hammond.

Frank Fowden, well known in past years as manager of the Brooks-Follis Electric Co., has joined the sales force of the Pacific States Electric Company at San Francisco.

Capt. C. E. Grunsky, topographical officer of the 115th Engineers stationed at Camp Kearney, San Diego, has been spending the holidays in San Francisco on furlough.

Wm. J. Davis, Jr., Pacific Coast engineer for the General Electric Company with headquarters in San Francisco, is now at Schenectady, N. Y., on a brief soourn in the East.

W. M. Jones, adjuster for the Pacific Telephone & Telegraph Company in Sacramento, Cal., has been appointed manager for the company in the Auburn, California, territory.

Allen Chickering, who is attorney for several of the utility companies of California, has just returned from an eastern trip devoted to a conference with the Secretary of the Treasury on the subject of the next Liberty Loan. Mr. Chickering has been extremely successful in the direction of previous Liberty Loan campaigns—and is counted on to carry the spring drive successfully over the top.

Ray Turnbull, in charge of heating appliance sales for the Pacific Coast district of the General Electric Company, has left for intensive training at one of the national aviation schools.

P. H. Ridgway, electrical and mechanical engineer of Seattle was some time ago commissioned Captain of Engineers U. S. R. and expects orders to report some time in January, 1918.

Fred Hotchner, formerly with the Novelty Electric Sign Company of San Francisco, is now a draftsman in the engineering department of the U. S. Army Balloon School at Fort Omaha, Nebraska.

C. E. Grunsky, consulting engineer, who has recently been attending a conference with the Secretary of the Interior in Washington as representative for the Imperial Valley Irrigation District, has returned to San Francisco.

John R. DuPriest, formerly head of the mechanical engineering department of the University of Idaho, Moscow, Idaho, has become professor of steam and gas engine design at Rensselaer Polytechnic Institute, Troy, N. Y.

I. Sternefeld, Westinghouse Export Company representative in Shanghai, was in Seattle recently. He came to the United States in October and after making a business tour of the eastern states was on his way back to his post.

F. W. Taylor, formerly purchasing agent for the Pacific Electric Railway at Los Angeles, has been appointed purchasing agent for the Southern Pacific Company, succeeding I. O. Rhoades, who has resigned after ten years of service.

Chas. L. Easton, formerly electrical superintendent of the southern division of the San Joaquin Light & Power Company, is now electrical superintendent of the Midland Counties Public Service Corporation with headquarters at Santa Maria.

R. R. Clark, a consulting engineer of Portland, formerly with the Oregon state highway department and until recently employed by F. A. Naramore, superintendent of school properties, has accepted a request from the Y. M. C. A. to go to France and supervise construction of a part of the buildings to be built from the proceeds of the recent \$50,000,000 fund subscribed.

John Coffee Hays, formerly president and general manager of the Mt. Whitney Power & Light Company, as announced in brief in the last issue of the Journal of Electricity, is now in charge of the utility organization at Camp Lewis with the rank of Major. Fifteen other utility men have been assigned to the 16 big cantonments in the United States under the conviction that they will operate the utilities of these training camps along the recognized lines of the public service corporations. These men have been given a rather free hand in forming a proper and workable organization, which at the outset consists of four Captains, one each as Superintendent of Power and Light, Superintendent of Water Supply and Sewers, Superintendent of Buildings and Grounds and Superintendent of Fire Protection, with a crew of about 200 non-commissioned officers and men. Some little rivalry will no doubt develop among the camps and it is naturally the ambition of each to give a good account of himself. The best wishes of electrical men in the West go with Major Hays in his good work at Camp Lewis.



SOME OF THE NOTED BUILDERS OF THE WEST WHO

Every one of these distinguished educators, executives and engineers have during the past twelve month period either contributed signed original articles to the Journal of Electricity or else given of their time for editorial conference. You, too, can assist in building up the West by helping in the subscription campaign of the Journal of Electricity which is now under way.

Never more than in this trying period of national crisis, when civilization itself is in the balance, has a greater need existed for a publication devoted to the development of the West which can gather in the news of interest to the electrical industry, properly weigh its value, reduce it to concise form and disseminate it to the reader.

The Journal of Electricity, now in its thirty-first year of service to the West, has during recent months undertaken the enlargement of its sphere of activities. Issue by issue new departments have appeared, new channels of interest and information opened until today it stands ready to boldly enter an even greater field of usefulness.

As the sole exponent and champion of the electrical industry in the West, it is devoting its entire effort to the development of this section. Read through its columns line by line, page by page, and you will find them ring strong and clear to the one thought, namely—the development of the West.

There is today an urgent need to show the world how the upbuilding of the West in the development of more water power, the establishing of new industries and the extension of agricultural production is a necessary national issue and should be given every national aid possible—especially should the Federal Banks be authorized to endorse notes for the extension of power supply and the building of needed industries when approved by the state and federal regulatory bodies under which they operate. Again, existing laws should be modified so that power permits on the public domain be at once made available for development.

To this end education is necessary. The Journal of Electricity has in course of preparation articles by men who have long and carefully studied these questions and who are qualified to discuss them—articles that will show how this great West is today an agricultural and industrial Mecca—and how its further upbuilding in the planting of new industries will help to contribute not only an invaluable part in winning the war but add to its future prosperity. Articles that will show how irrigation brought about by electrical pumping is today putting under cultivation thousands of new acres in beans, rice, corn, raisins and other necessities in foodstuff—articles that show how the great oil wells of the West, producing twenty-five per cent of the world's supply of fuel oil, are today electrically operated from the giant water wheels in the high Sierras hundreds of miles distant from them, and thus conserving the oil otherwise necessary in the pumping of the oil itself.

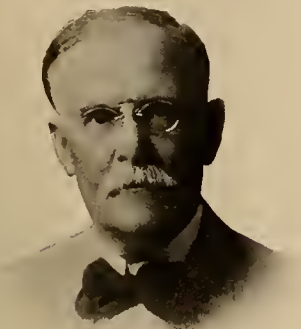
And then there is ship building, the mining of ores necessary in the making of munitions, the electrification of the railways and many other industries that are making the West an indispensable factor in the cause of democracy.

The great task of enlightening the world at large as to the possibilities of the West, and of building a greater, more useful West has been undertaken by the Journal of Electricity.

In order that our efforts may be made more effective and we be enabled to carry out these plans, it is absolutely necessary that our circulation be materially increased at once.

Will you take a personal part in this great work? If you are not now a subscriber, will you send in your own subscription and in addition see to it that those associated with you put their shoulders to the wheel and become individual subscribers?

HAVE ASSISTED THE JOURNAL OF ELECTRICITY



Benjamin Ide Wheeler, president of the University of California, which is exceeded in enrollment by but one other American university, Columbia, itself perhaps the largest university in the world. Dr. Wheeler has freely given of his valuable time and advice in conference with members of the editorial staff of the Journal of Electricity.



John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, which comprises the largest system of hydroelectric distributions in the world. Mr. Britton has proven ever ready to assist in matters of public policy and in original contributions on the water power situation discussed in the columns of the Journal of Electricity.



R. H. Ballard, vice-president and assistant general manager of the Southern California Edison Co., a company which in its reorganization comprises many feats in engineering and managerial activity that establish new world records. Mr. Ballard has ever proven himself a warm friend of the Journal of Electricity and on many occasions has given of his time and energy in its behalf.



E. C. Jones, the noted gas engineer of the Pacific Gas & Electric Company, an eminent authority on oil gas manufacture, has ever been glad to pause sufficiently in his busy activities to contribute to the Journal of Electricity on matters pertaining to gas by-products and their possible uses in the electrical industry.



C. E. Grunsky, perhaps the most noted civil engineer of the West in the present generation, is now contributing a series of articles in the columns of the Journal of Electricity on rate fixing that is being followed by a nation-wide group of readers.



Frank G. Baum, an engineer of international reputation in hydroelectric installation, in this issue contributes original matter to the columns of the Journal of Electricity on initiative and effort in war and in peace.



Herbert Hoover, an engineer of international reputation and the present Federal Food Administrator, has found time to personally commend the Journal of Electricity for its War Service work.



Harris J. Ryan, professor of electrical engineering, Stanford University. Professor Ryan, beloved by a host of engineers of the West, his former students, is ever ready to assist in problems especially related to high tension insulation.



Max Thelen, president of the California Railroad Commission and a national figure in utility regulation, has always been approachable and ever willing to assist in advisory matters looking toward efficient utility regulation.



John D. Galloway, builder of the longest aerial stretch of wire in the world, the crossing of Carquinez Straits, has also proven himself a warm friend of the Journal of Electricity in his notable contributions on military training for civilian engineers.



A. E. Chandler, the well-known water authority of the California Water Commission, has for years been a strong friend of the Journal of Electricity and is now contributing a widely read series of articles on recent advances in western Water Law.



Joseph N. LeConte, professor of engineering mechanics at the University of California, and son of the renowned geologist by the same name, has from time to time sent in matter for publication in the columns of the Journal of Electricity on hydraulic measurements of the highest engineering and scientific value.

Theo. F. Dredge, Pacific Coast representative of the Pittsburgh Piping and Equipment Co., is an excellent exponent of western ideals in handling Red Cross campaign work. The X-ray photograph shown herewith is not that of a dead skull but one filled with living, throbbing thoughts for the



cause of democracy. The Red Cross which shows in the photograph was brought out at a recent lecture on the X-ray before the San Francisco Electrical Development League in which Mr. Dredge's skull was photographed. Incidentally men of the electrical industry are taking the leading part in Red Cross service work throughout the West. In the great San Francisco Christmas drive the following familiar faces were seen: General—John A. Britton, Chairman of San Francisco Chapter, vice-president and general manager Pacific Gas & Electric Co.; Colonel—Theo. F. Dredge, Campaign Manager, Pittsburgh Piping & Equipment Co.; Major—A. H. Halloran, Executive Secretary, Journal of Electricity; Captain—R. E. Fisher, Assistant Executive Secretary, Pacific Gas & Electric Co.; Major—Geo. C. Holberton, Electric Co-operation, Pacific Gas & Electric Co.; Major—W. W. Briggs, Electric Co-operation, Great Western Power Co.; Captain—W. S. Coleman, Assistant in Electric Co-operation, Pacific Gas & Electric Company; Major—Geo. Springer, Communication, Pacific Telephone & Telegraph Company; Captain—A. B. C. Cooper, Communication, Pacific Telephone & Telegraph Company; Major—Jas. G. Decatur, Communication, Western Union Telegraph Co.; Major—A. F. de Forest, U. S. Steel Products Corporation; Captain—F. E. Boyd, General Electric Co.; Captain—T. E. Bibbins, Pacific States Electric Co.; Workers—E. O. Shreve, A. V. Thompson and R. M. Alvord, General Electric Co.; W. M. Deming, Journal of Electricity; D. E. Harris, Pacific States Electric Co.; H. R. Noack, Pacific States Electric Co.; Van Hooser, Pacific States Electric Co.; C. R. Hunt, Robbins & Myers; M. E. Hickox, Pacific States Electric Co.; W. K. Brown, Crocker-Wheeler Co.; C. E. Ingalls, Crocker-Wheeler Co.; J. W. Redpath, Contractors' Association; F. W. Buzzell, Buzzell Electric Works. Captain—Miles F. Steel, Benjamin Electric Mfg. Co.; Workers—A. E. Rowe, Garnett, Young & Co.; S. B. Gregory, Arrow Electric Co.; C. F. Butte, Butte Engineering Works; Murray Orrick, Western Electric Co.; H. B. Squires, H. B. Squires Co.; T. E. Simpson, Federal Sign System; Samuel Russell, H. W. Johns-Manville Co.; Earl Brown, H. S. Tittle Co.; Tom Bennett, Rex Electric Co.; F. J. Cram, Electric Appliance Co.; L. E. Sperry, N. Y. Insulated Wire Co.; Harry Sayles, Holabird Electric Co. The present reports indicate that over 84,000 members have been obtained in San Francisco and the final returns are expected to mount up to 90,000.

George H. Harries, of the Byllesby organization, who has been Brigadier General in charge of the 59th Depot Brigade at Camp Cody, Deming, N. M., for the last several months, has been transferred to Camp Jackson, Columbia, S. C., in command of the 186th Infantry Brigade.

Miss Elsie Eaves has been elected president of the Combined Engineers at the University of Colorado, an organization composed of engineering students. This is the first time in the history of the University that a woman has held this honor.

Leonard S. Cairns, assistant general manager of the Manila Electric Railroad & Light Company, Manila, P. I., has been appointed general manager of the Eastern Pennsylvania Railways Company, Pottsville, Pa., by the J. G. White Management Corporation, New York City, the operating manager of both companies. He succeeds L. H. Palmer, who lately became assistant to the president of the United Railways & Electric Company, Baltimore, Md.

B. M. Warner, general superintendent of the various Spreckels companies at San Diego, Cal., comprising the San Diego Electric Company, the San Diego & Southeastern Railway and the Point Loma Railroad, has been chosen chairman of the board of economics which has been created to handle important matters pertaining to the operation, maintenance, construction, etc., of the companies. He has been also appointed manager of the Coronado Beach Company, the Coronado Water Company and the United Light, Fuel & Power Company, with jurisdiction over the engineering, hotel power plant, tent city departments and other interests.

F. W. Milligan, president of the General Porcelain Company of Parkersburg, West Virginia, is in San Francisco. During his sojourn in the West he is investigating the advisability of establishing a plant for the manufacture of porcelain ware in the San Joaquin Valley.

Geo. L. Wright, assistant electrical engineer of the Southern Pacific Company at Portland, has been appointed a Lieutenant in the U. S. Naval Reserve. He is now at Annapolis together with ninety-nine other electrical engineers undergoing a brief course in training at the Naval Academy.

L. G. Van Ness, vice-president of the Memphis Gas & Electric Company of Memphis, Tenn., has resigned. Mr. Van Ness is a graduate of the University of Wisconsin. He got his electrical training under D. M. Jackson, who later became the head of the Boston School of Technology. He is one of the ablest electrical engineers in this country. He will remain in Memphis and engage in consulting work.

F. E. Boeken has recently been appointed superintendent of the San Francisco Municipal Railway to succeed Thomas



A. Cashin who died on Dec. 5, 1917. Mr. Boeken was formerly assistant superintendent of the railway and was advanced to acting superintendent to meet the emergency. Later his appointment was made permanent. He is the second to hold this position, Mr. Cashin having been appointed before the actual construction of the city lines. The Municipal Railway in San Francisco originally started by

the electrification of the Geary street lines. Today feeders to the system traverse many sections of the populous residence districts of the city.

OBITUARY

C. O. Smith, manager of the Lewis County Light & Telephone Company at Morton, Wash., was recently found dead at the power plant of the company on the Tilton River. The cause of death is unknown.

MEETING NOTICES FOR ELECTRICAL MEN

(The Convention of the American Society of Mechanical Engineers with its consideration of war time service was the outstanding feature among the meetings of the month. There follow accounts of local meetings and a forecast of spring conventions in the announcement of the Pacific Coast N. E. L. A. Convention scheduled for Del Monte in April. The directory of western electrical societies is a new Journal service.—The Editor.)

War Convention of Mechanical Engineers

War topics predominated at the convention of The American Society of Mechanical Engineers, held during December at New York, the engineers discussing the shipbuilding problem, the aircraft problem, the fuel problem, the agricultural problem, etc. Methods were considered whereby the problem of fuel conservation will be met either by compelling coal consumers to execute such measures of economy as the authorities prescribe, or else by disseminating correct information regarding the mining and consumption of coal, accompanied by an appeal to the patriotism of the consumers. Such subjects as expenses and costs, accident prevention, labor turnover expense, and the relation of industrial management to engineering, were discussed.

How the 30,000 engineers represented in the great technical societies of this country are quietly serving the government in performing all manner of duties—confidential and otherwise, was disclosed by Mr. Gano Dunn, chairman of the Engineering Committee of the Council of National Defense. Mr. Dunn said the Government had made numerous and various calls upon engineers for service, and there is not yet on record a single case in which the Government has asked an engineer to perform a service and the service has not been promptly and faithfully rendered.

Dr. Ira N. Hollis, retiring president, in his presidential address spoke on "Service of the Engineer to the Public in Times of Crises." The keynote of Dr. Hollis' address on "Universal Public Service in Peace and War" was that training for citizenship is the safeguard for democracy. In speaking of the engineers' relation to the present war, Dr. Hollis said:

"It is our task as engineers to assist in making the world safe against the forces that we have unloosened, so that the century may not close with a total failure of the civilization of Christian races. It is we who have developed the application of science, and it is we who are using it to destroy one another, forced into the struggle by the rulers of a nation that knows no right except might, and no mercy except that which is taught them by the sword.

"The twentieth century is still young, and we do not yet know what it will represent to the future historian. Will it be the debauch of science or will it mean a new birth to Christianity? It is the engineers' task to decide this. There are two tendencies: one toward greater comfort and luxury, and one towards greater service. The first can plunge us only deeper and deeper into war for the control of a commercial output. It can only bring us more firmly under a governing class derived either by birth or by commercial

success. The second means the complete emancipation of the individual trained to think of service as the chief source of good government and happiness in life. The only theory that will hold men together is that of service."

Honorary membership was conferred upon Major-General George W. Goethals in recognition of his achievements in engineering, and ex-President Taft addressed the engineers on "The War's Call to Professional Men." These functions, which were held in the impressive auditorium of the Engineers' Building, were followed by a reception to the new president of the Society, Mr. Charles T. Main.

Los Angeles Jovian Electric League

The December 12th meeting of the Los Angeles Jovian Electric League was devoted to a demonstration of Mental Wireless by "Mercedes," the Orpheum headliner, assisted by Mlle. Stantone. The speaker's table was done away with for the day and the entertainment given the center of the stage. Paul Howse of the Electrical Products Corporation was Chairman of the Day. The December 17th meeting was under the able guidance of R. B. Rawles, of the U. S. Steel Products Company.

Portland A. I. E. E. and N. E. L. A.

A special meeting of the Joint Sections of the A. I. E. E. and N. E. L. A. was held in the Electric Building, Portland, Wednesday evening, Dec. 12th at 8 p.m.

Mr. Mitchell of the Flanders, Frary & Clark Co. gave an illustrated talk on Universal Heating Devices, giving a description of the methods employed in manufacturing these devices and also methods of

selling same. Lantern slides were shown to illustrate this talk.

The talk met with the hearty approval of those present, as Mr. Mitchell has had lots of experience at the game.

The next meeting will be held Jan. 8th, 1918 at the Multnomah Hotel under the auspices of the N. E. L. A. The speaker of the evening will be W. J. Santmyer, Advisory Engineer, Puget Sound Traction, Light & Power Co., Seattle, Wash. His subject will be "Powdered Coal for Fuel."

Oregon Irrigation Congress

The seventh annual Irrigation Congress for Oregon will convene at the Imperial Hotel, Portland, Oregon, the first week in January, beginning Wednesday morning, Jan. 2nd and closing Saturday night. The program will include a discussion of the state and national policies of reclamation and reports on the irrigation projects of the state. On Friday, Jan. 4th, an excursion to Corvallis and a joint session with the State Drainage Association is planned.

An exceptionally interesting convention is expected with a large attendance of Oregon men engaged in irrigation work.

BUILDERS OF THE WEST—XX



A. GRANT MCGREGOR

In the building of an empire, the engineer has a broad field of opportunity. The designing and constructing of giant smelters and leaching plants has called forth investments of millions of dollars in the West and has enabled the West to boast of industrial activities, largely electrically operated, that for efficiency and magnitude of operation are found nowhere else. To A. Grant McGregor, mechanical and metallurgical engineer of Arizona, this issue of the Journal of Electricity is dedicated in appreciation of his giant accomplishments in the great Southwest.



THE APRIL CONVENTION OF THE PACIFIC COAST SECTION, N. E. L. A.

Beautiful Del Monte has been selected as the gathering place for the second annual convention of the Pacific Coast Section N. E. L. A. The convention will be called to order on Thursday morning, April 25, 1918. As at the Riverside convention, two days of sessions will be devoted to commercial and engineering discussions.

Already entertainment features to make this the most profitable and enjoyable event of the year are in course of preparation. Thursday evening, April 25, 1918, will be devoted to a general gathering in the hotel followed by a ball, Friday evening will be the banquet, Saturday morning field events and the golf tournament, while Saturday afternoon will be given over to the famous seventeen mile drive.

The earnestness with which preparation is being made for the series of papers to be discussed and the enthusiasm with which entertainment features are being planned for the guests of the convention at the famous Del Monte Hotel presages a gathering that will pass down into history as in full keeping with the best traditions of the electrical industry.

Details of committee appointments will be announced in the next issue of the Journal of Electricity. Meanwhile it is well that every member of the Pacific Coast Section set aside the last week in April, for under the able leadership of President H. F. Jackson a convention will be held that will be found profitable and enjoyable and yet in full keeping with the spirit of the times.



WHERE THE MEN OF THE INDUSTRY MEET

(With the idea of providing a place of reference for electrical men who are traveling and wish to get in touch with those of allied interest in a stranger town and for the man who may have forgotten the information in regard to his own society, this directory has been made out. Information concerning other groups or changes of officers are welcomed and will be carefully attended to. Address "Service Department, Journal of Electricity."—The Editor.)

A. I. E. E.—WESTERN SECTIONS AND BRANCHES

National Officers

President—E. W. Rice, Jr.
Secretary—F. L. Hutchinson.
Meetings—Monthly.

Los Angeles Section

Chairman—Don D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittcock Block, Portland, Ore.
Meetings—Monthly.
January Meeting—Jan. 8, 1918—"Four Years Operation of the Big Creek System."

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m. followed by regular meeting.
January meeting—Jan. 19th—"The Manufacture of Military Explosives."

San Francisco Section

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
December Meeting—Dec. 21, 1917, Chamber of Commerce Assembly Room. Speakers: Prof. H. V. Carpenter of the State College of Washington and C. M. Fisher, Engineer in the Transmission Department of the Washington Power Co. Subjects: "Some Applications of the Electron Theory," "Corona as Affecting Transmission Lines."

Utah Section

Chairman—A. S. Peters.
Secretary—H. T. Plumb.

Vancouver Section

Chairman—R. F. Hayward.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

University of California Branch

Chairman—A. J. Swank.
Secretary—G. F. Teale, University of California, Berkeley.

University of Colorado Branch

President—Robt. Newman, 1071—11th Street, Boulder, Colo.
Secretary—William N. Gittings, 2429—12th Street, Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Ida.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper.
Secretary—L. H. Hoppold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg. Next meeting—Jan. 18, 1918.

Throop College of Technology Branch

Chairman—J. Paul Youtz.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stiles, 301 Montgomery Street, Pullman, Wash.
Secretary—E. W. Tollefson, Box 393 College Sta., Pullman, Wash.
Meetings—Bi-monthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

President—Col. Robley Stearnes.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.

California Association of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery Street, San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Association of San Francisco

President—E. E. Brown, 245 Minna Street, San Francisco.
Secretary—C. L. Chamblin, 641 Mission Street, San Francisco.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive Street, Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Nevada Association of Electrical Contractors and Dealers

President—R. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Association of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark Street, Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland.
Meetings—Every Saturday, 1:30 p.m.—Secretary's office.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electric Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Association of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers' Association

General Secretary—Franklin Overbath, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd Street, San Francisco.
Secretary—Albert H. Elliot, 544 Market Street, San Francisco.
Meetings—Quarterly. Next meeting—Del Monte, January.

OF GENERAL ELECTRICAL INTEREST

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually in April.
Next Meeting—Del Monte, April 24-27, 1918.

Northwest Electric Light and Power Association

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next Convention will convene in Portland, September 11, 1918.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annual, in February.

Portland N. E. L. A.

Chairman—J. C. Henkle, Portland Railway, Light & Power Co.
Secretary—H. H. Schoolfield, Pac. Power & Light Co., Spalding Bldg., Portland.

Illuminating Engineering Society

President—G. H. Stickney.

Secretary—Clarence L. Law.

Western representative—Romaine Myers, Bacon Bldg., Oakland.

San Francisco Electrical Development and Jovian League

President—Robert Sibley, Crossley Bldg., San Francisco.

Secretary—J. D. Redpath, Rialto Bldg., San Francisco.

Meetings—Every Wednesday, 12:10 p.m. luncheon, Palace Hotel.

Next Meeting—Jan. 9, 1918—Ladies' Day.

Los Angeles Jovian Electric League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.

Secretary—W. C. McWhinney, Southern California Edison Co.

Meetings—Every Wednesday, 12 m., Jahnke's Tavern, 524 S. Spring Street.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—W. L. Vorse.

Secretary—O. E. Stanley.

The Engineers' Club of Seattle

President—E. B. Hussey, Alaska Bldg., Seattle, Wash.

Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg.

Buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco

President—B. P. Legare, 58 Sutter Street, San Francisco.

Secretary—J. R. Brownell, 525 Market Street, San Francisco.

MISCELLANEOUS**Electrical Credit Association of the Pacific Coast**

President—C. L. Gilson—Gilson Electrical Supply Co., 304—12th

Street, Oakland, Cal.

Secretary—Albert H. Elliot, 502 Flatiron Bldg., San Francisco.

Meetings—Annually—San Francisco, May.

Foreign Trade Club

President—W. H. Hammer.

Secretary—Wm. E. Hague.

Meetings—238 Merchants Exchange Bldg., San Francisco.

December Meeting—Dec. 12th. Subject: Business Conditions in Russia. Speaker: F. W. French.

American Ass'n for the Advancement of Science—Pacific Division

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.

Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, California.

Meetings—Annual. Next meeting—March 28-30, 1918, Throop College of Technology, Pasadena, California.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.

Secretary—Henry Bostwick, 445 Sutter Street, San Francisco.

Meetings—Annual. Next convention—September, 1918 in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.

Secretary—Chas. H. Delany, 445 Sutter Street, San Francisco.

Meetings—Quarterly.

HAPPENINGS IN THE INDUSTRY

Changes and Beginnings

The Electric Supplies Distributing Company, San Diego, Cal., Sam L. Hall, manager, has taken over the business and stock of the wholesale department of the Southern Electrical Company, and announces the opening of its business (wholesale only) in the Spreckels Building, 924 Second street, San Diego.

The Wallowa, Oregon, exchange of the Home Independent Telephone Company has just been moved into a new brick building and the company is planning to install a new switchboard in the near future. About 250 subscribers are served from this exchange.

M. C. Baker and Son of 636 Market street announce their removal to 686 Mission street, San Francisco, where the store is to occupy the first floor and basement. The business is to continue in the electric contracting line, making a specialty of ventilating, spiral compress and auto springs and other lines. The business will open in its new quarters on January 1st.

The McFell Electric Co. have removed their headquarters to 133 Fourth street, San Francisco, where they will continue their contracting business and carry a stock of electrical supplies. They will hereafter be known as the Watts Electric Co., with same officers and management. The change is in name only.

The Calistoga Electric Company, operating an electric lighting business at Calistoga, has removed its headquarters from Oakland to San Francisco.

The Nevada, California & Oregon Telephone & Telegraph Company has recently been authorized to operate in Oregon. It is a Nevada corporation, capitalized at \$300,000. The officers are: President, Scott Hendricks; vice-president, A. A. Rosenshine; secretary, W. E. Hills, all of San Francisco; general manager, A. J. Mathews, and director, Jules Alexander, both of Susanville, Cal.

Financial Notes

Application has been made to the Yukon court at Dawson, Y. T., by the Granville Mining Company, a bondholding company which includes Chester A. Beatty and Herbert C. Hoover, the United States food controller, for a receiver for the Canadian Klondyke Power Company which is alleged to have failed to insure bonds for a loan of \$350,000 or pay interest thereon.

The Oakland, Antioch and Eastern Railway Company is to issue \$435,853 in short term notes. It is understood that these are to be absorbed by San Francisco and Sacramento banks.

Gas & Electric Sales Company, San Francisco, has been granted a permit to issue 20,000 shares to V. A. Kuehn and M. J. Purcell in exchange for a stock of goods and \$5000 cash; and to sell 15,000 shares at par, \$1 per share, net to the company.

A dividend of \$1.50 per share on the preferred stock was declared November 9th by the directors of the San Joaquin Light and Power Corporation to stockholders of record November 30, 1917, payable December 15, 1917.

McDonnell & Company announce an offering of 6 per cent serial bonds of the Ochoco Irrigation District of Cook County, Oregon, at par. The bonds, which are dated July 1, 1917, are offered in denominations of \$1000 and \$500 and they are an absolute tax lien ahead of any mortgages on 22,000 acres of land, comprising the district, which is situated in one of the richest agricultural sections of Oregon.

New Power Loads

Three fruit and vegetable evaporating plants are now running in Walla Walla, Wash., having a combined capacity of 45 tons daily. All of these plants are run in part by electric power.

Puget Sound shipbuilding facilities, including the yards at Olympia, are to be trebled immediately through the direct efforts of the government, the Federal Shipping Board announced recently, in opening a special office at Seattle to direct the work.

The Eureka division of the Western States Company has completed an installation to serve a new creamery at Arcata, California. A 20-horsepower motor will be used during construction of this creamery and when completed in April 125 horsepower will be connected to the company's lines. A new extension to serve Junction City has been made and that community will be connected to the company's lines soon.

Jones Brothers Company, North Yakima, Wash., has purchased the old condensary site at the north end of First Avenue and expects to operate a vinegar and fruit juice factory. This company has factories at several other points and controls 90 per cent of the vinegar sold in the United States. The plant will take from 60 to 70 horsepower to operate and will have a capacity of 50,000 barrels of vinegar per year.

Personal Items

E. J. Young, consulting engineer and geologist, recently installed in his offices in the Story Building, Los Angeles, an analytical laboratory that is complete in every detail. Mr. Young intends to use his laboratory solely for determinative and research work in connection with his private practice.

Willis H. Booth was chosen chairman of the Board of the new Edison Electric Appliance Company, which represents the amalgamation of the Hotpoint Electric Heating Company with the Hughes Electric Heating Company and the Domestic or Household Heating Device business of the General Electric Company. Geo. A. Hughes is president, A. K. Baylor vice-president, and E. H. Richardson, A. F. Vaughan, G. F. Morrison, C. E. Patterson, and H. C. Houck on the Board of Directors. W. H. Booth and E. H. Richardson are at present officers of the Hotpoint Company and G. A. Hughes and G. F. Vaughan of the Hughes Company. P. H. Booth, now sales manager of the Hotpoint Company, with W. H. Booth and E. H. Richardson will act as sales manager of the new company. The complete factory, engineering and commercial forces of the Hotpoint and Hughes Companies will go over to the new company.

New Business

NePage, McKenny Company, electrical engineers and contractors with head office at Seattle, report that the Portland office of the concern has closed a contract for complete electrical wiring in a \$100,000 residence in Portland.

The F. E. Newberry Electric Company's Los Angeles branch has been awarded the contract for the electrical work in the J. B. Van Nuys Bank Building on South Spring Street, Los Angeles, California.

The Seattle office of Allis-Chalmers Manufacturing Company reports that the Rainier Heat & Power Company, a local concern, is installing a 500 kilowatt Allis-Chalmers generator set. It also reports that the Snoqualmie Falls Lumber Company at Snoqualmie Falls, Washington, has started its 4000 kilowatt Allis-Chalmers steam turbine, the largest installation of this kind in the United States. The office has just closed a contract with the city of Seattle for four 1000 k.w. transformers for installation in the shipyards of the Skinner & Eddy Corporation.

Baker-Joslyn Company has recently secured a contract from the city of Seattle for weatherproof wire.

Pacific Fire Extinguisher Company, 507 Montgomery street, San Francisco, has the contract for electric wiring in a \$200,000 store and office building being erected at Fresno, Cal., for Frank Short. The electrical work amounts to \$3500. It is planned at some future time to add six additional stories to the two now being erected.

During the first ten months of 1917 the electrical dealers of San Diego sold 3734 electrical appliances as follows: 1579 irons, 296 grills, 286 toasters, 251 radiators, 195 curling irons, 175 vibrators, 163 vacuum cleaners, 136 heating pads, 112 sewing machine motors, 85 water heaters, 77 percolators, 55 ranges, 54 disc stoves, 38 washing machines, 17 soldering irons, 12 ovens, 9 chafing dishes, 9 cigar lighters, 1 ironing machine, 184 miscellaneous.

City Will Purchase Line

An ordinance has been passed in Seattle, calling upon the board of public works to acquire by purchase the line and equipment of the Loyal Heights Railway Company, the same to be operated as a part of the present municipal lines of the city. The owner of the line, Harry Whitney Treat, has agreed to accept for it the sum of \$40,000. Payment is to be made in city railway extension bonds. The line will extend, with construction already authorized, to the northerly city limits.

Extension Course in Salesmanship

"Fine salesmanship has come into its own in this period of close competition," says James Lynch, president of the Sales Managers Club and retiring president of the San Fran-

cisco Rotary Club, who began a course in Salesmanship for the University of California Extension Division Monday evening, Dec. 3rd, at 7:30 at the Hotel Oakland. The course will be given in a series of ten weekly lessons. Mr. Lynch's long years of experience as a salesman, together with his constant study of the subject under the most able teachers, has well fitted him for telling others the fine points in the business. He is conducting two very successful courses in salesmanship for the University in San Francisco, registration for which may be made at the San Francisco office, 62 Post Street.

Pacific Power & Light Company Prospers

For October earnings of the Pacific Power & Light Company, Portland, showed a gain of 32 per cent and for the past year, 16 per cent. With this satisfactory showing, the determination has been reached to offer the public \$200,000 of the unissued seven per cent cumulative preferred stock, with a view to taking up short term six per cent notes, sold for improvements and extensions. The gross earnings for October were \$151,310, operating expenses \$73,118. For 12 months the gross earnings were \$1,608,309 with operating expenses of \$832,591.

War Conservation Work in California

The California Railroad Commission recently instituted a formal investigation into the question of what can be done in the construction and operation of California electric utilities during the war in order to make the electrical industry of this state most efficient and most helpful to the nation in the present emergency.

This action was taken after careful consideration of the resolution adopted by the San Francisco Electrical Development and Jovian League on the 19th of December and in accordance with plans which were already being formulated by the Commission. This investigation has been assigned to Commissioner Devlin.

Stockholding Customers

With a view to making stockholders of their customers, the Utah Power and Light Company is offering a block of 7 per cent cumulative preferred stock to its customers. Announcement of this offer is made through a large advertisement in the newspaper and through cards and circulars which were sent around to every consumer on the books. Before this announcement was made customers had already purchased more than \$1,300,000 of this stock in the open market, and since that time others have taken advantage of the opportunity to buy the stock direct from the company at par (\$100 a share), \$70,000 of this stock having been purchased during the last few weeks. At the present time, therefore, more than \$1,370,000 of the 7% Cumulative Preferred Stock of Utah Power & Light Company is owned by their customers.

The Pacific Power & Light Company, which covers with its lines many towns in Oregon, Washington and Idaho, is at the same time offering direct to the consumers preferred stock for cash or on a time payment plan. The company also seeks in this way to obtain a wider distribution of its stock among the residents of the territory which it serves. A limited amount of Pacific Power & Light Company 7% cumulative preferred stock of the par value of \$100 per share will be offered.

Wages Outrun Earnings

Although new economies were adopted by the Portland Railway, Light & Power Company the first of October, the earnings of the company failed to show such a margin as would meet the increased wage schedules for the employees, which became effective the middle of the month. Gross earnings showed an increase of \$62,574 over October of last year but the operating expenses were \$83,577 greater. Gross earnings for October 1917 were \$522,294, operating expenses \$292,298; October 1916 gross earnings were \$459,720, operating expenses, \$208,721.

LATEST IN EVERYTHING ELECTRICAL

(The difficulty of obtaining a correct reading by voltmeter of the reactive drop on feeders supplying a varying power factor load has been overcome by the use of a new line drop compensator which makes it possible for the resistance and reactance of the line to be reproduced in miniature and registered accurately in the voltmeter. A variety of new safety switches, an outdoor switch house and a duplex adapter which transforms a single to a double plug socket are further listed.—The Editor.)

LINE DROP COMPENSATOR

When automatically operated induction regulators are used for compensating for line drop on lighting feeders supplying a non-inductive load, or a constant power factor inductive load, correct results will be obtained when the regulator is controlled by a contact making voltmeter having a compound winding. On feeders supplying a varying power factor load, however, the compound winding of the voltmeter will correctly reproduce in miniature the resistance drop as existing in the feeder, but not the reactive drop. Consequently, to obtain correct compensation for the latter condition of operation, which is being adopted more generally by central stations, it is necessary to use in conjunction with



A new line drop compensator

the contact making voltmeter a device which will reproduce in miniature on the voltmeter the resistance and reactance drop as found in the line under varying condition of load and power factor.

The General Electric Company has recently developed a new line drop compensator. This compensator when used in connection with any contact making voltmeter will enable the regulator to provide correct voltage compensation to any given point on the feeder regardless of the load or the power factor. The compensator consists of a resistance and a reactance, each independently adjustable by means of dial switches, whereby the resistance and the reactance of the line may be reproduced in miniature and the effect of the load on the line reproduced in the feeder regulator control, i. e., in the contact making voltmeter.

The compensator can be furnished either with or without

a one to one insulating transformer, the latter design permitting the grounding of both current and potential transformer circuits. It can be connected in circuit with any contact making voltmeter of General Electric manufacture without any change in the meter regardless of the type or design, and once properly adjusted for the line will cause the regulator to maintain correct voltage within its limits of range and capacity.

The units of the compensator are assembled in a neat, compact case suitable for mounting on the switchboard if desired. It is easily adjusted, and after correct conditions are obtained for a given feeder requires no further attention.

V. V. SAFETY SWITCHES

Among the recent safety devices of interest are the 4 types of safety switches manufactured by the V.V. Fittings Company, Philadelphia, Pa.

The type "C.S.F." consists of a sheet steel box, whereas the type "W.S.F." consists of a cast iron weatherproof box. In each case high grade switch features are embodied in the mechanism and also "straight pull" and "push operation" which is a different and more positive operation than embodied in the usual switch.

The type "S.F." consists of a cast iron weatherproof box and the switch handle is arranged with a spring lever so that the switch can automatically be locked "In" or "Out" by the operator.

The "D.F." Quick Make and Quick Break Safety Equipment consists of a high grade of safety mechanism of very rugged construction and perfected mechanical operation. In a box where the operation of the switch is not seen it is very essential that the switch be made Quick Make as well as Quick Break to prevent arcing of contacts. This feature together with the durable construction insures long life even under the severest mechanical uses.

The "D.F." equipment consists of a switch box and fuse box; the fuse box can be supplied either at the top or at the bottom as may be desired. The arrangement makes it impossible to open the fuse box door until the switch is out and impossible to close the switch until the fuse box door is closed and locked. Plenty of room is allowed for wiring connections as large side openings are provided. The switch can be locked "in" or "out" so that proper protection is allowed to men working on the line. These switches can be made for 250, 500 and 600 volts and 30 to 1000 amperes.



Type "S.F."

Type "W.S.F."

Type "C.S.F."

S. F. AND D. F. TYPES OF V. V. SAFETY SWITCHES

A SPARTAN NOVELTY

A "Duplex Adapter" which transforms a single outlet receptacle into a "double service" receptacle from which two portable lamps or devices can be simultaneously fed, has been added by the Bryant Electric Company of Bridgeport, Conn., to their well known "Spartan" line of interchangeable receptacles and plugs.

The new device, which is known as the "KH Spartan Duplex Adapter," consists virtually of a double "Spartan"



A DUPLEX ADAPTER

receptacle and a "Spartan" plug combined. The plug can be inserted into any of the standard "Spartan" receptacles and two outlets are then provided which will take any "Spartan" plug cap, either of the "parallel" blade or "polarity" type. It can also be used in conjunction with the "Spartan Screw Base Adapter" to transform an Edison screw base socket or receptacle to a duplex "Spartan." The adapter is National Electrical Code Standard.

OUTDOOR SWITCH-HOUSE CONSTRUCTION

Large power companies are coming more and more to buy portable switching and metering equipments in quantity in order to be in position to connect up desirable loads along transmission lines. They are thus enabled to reach small

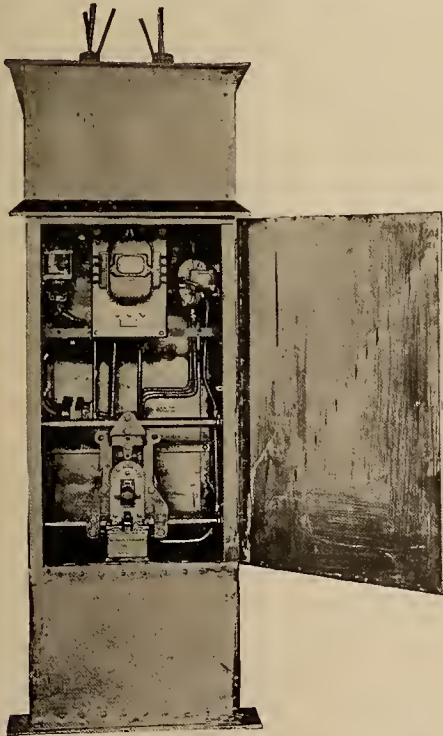


Fig. 1.—Improved Outdoor Switch-House

plants where the load is not large enough to warrant the expense of a substation with indoor apparatus. The increasing popularity of this form of equipment has naturally resulted in a steady development in the design and construction of switch-houses, especially with a view to increasing their accessibility.

A very open type of construction has recently been brought out by the Westinghouse Electric & Manufacturing Company, that provides the maximum of accessibility. In this switch-house, which is shown in Fig. 1, the oil circuit-breaker is mounted on a specially constructed bracket and the meters are mounted on a slate slab. The bracket is so designed that it will take different sizes of breakers.

SERVICE DEPARTMENT

The following is a partial list of the applicants on our books. Employers interested in any of those listed will please use the file number in communicating with the Service Department, Journal of Electricity.

Positions Wanted

B 1—Electrical Engineer or Electrical Foreman.—Age 29. Married—1 child. University graduate. Six months electrical helper; four years electrical engineer for state. Recently compiler in charge of equipment. Desires construction work. Wants \$150.

J 1.—Salesman or in Purchasing Department.—Age 31. Married. Two years college. Two years manufacturing company; five years central station work in commercial departments. Would not consider sales work with power company. Wants \$150.

J 2—Traveling Salesman or Advertising Department.—Age 21. Unmarried. Two and a half years advertising and traveling experience—electric piano, electric sign, etc. Desires work in California or Oregon. Wants \$100.

K 1—Electrician (Foreman).—Age 36. Unmarried. Ten years power station; one year power company; 2 years mining company. Wants \$150.

L 1—Electrical Locomotive Engineer or Superintendent Light and Water Works.—Age 33. Married, 2 children. Six years steam traction engines; four years chief engineer and electrician industrial works; six years town superintendent water and light, two years city superintendent water and light. Desires position in warm climate for child.

P 1—Electrical or Mechanical Engineer.—Age 36. Married—1 child. Three years college. Thirteen years electrical distributing department; one year construction work; one year railroad work; six months irrigation survey. Wants \$135.

R 1—Winder or Repair Man.—Age 27. Unmarried. Scotch. Five years apprenticeship; one year railway company; six years winding and construction. Wants \$100.

S 1—Electrical Engineer (would consider sales work, superintendent, etc.)—Age 35. Married. University graduate. One year electrical construction work; one year testing dynamos; one year operator in power station; four years foreman; one year construction work; two years chief electrician, power and light company; one year shop work; taught University extension. Wants \$150.

T 1—Superintendent of Operation or Construction (electrical or mechanical engineer).—Age 42. Married—3 children. Twenty years varied experience: foreman diamond drills, South Africa; electrician sergeant U. S. army; chief engineer power company; foreman of construction, mining company; chief engineer power equipment mining company, etc. Wants \$250-\$300.

W 1—Chief Engineer or Assistant to Manager.—Age 37. Married—1 child. University graduate. Engineering apprenticeship course. One year salesman electrical machinery; one and a half years assistant electrical inspector; 8 years electrical inspector and electrical engineer. Wants \$250.

Women's Department

C 1—Executive Position of Any Sort, or Welfare Work. University graduate—post graduate work. Two years teacher; two months library; two months office work; three months Y. W. C. A. Wants position with good future.

Also—several young women with accountant's training, several stenographers, etc.

BOOKS AND BULLETINS FOR ELECTRICAL MEN

Publication of Technical Work of Joint Committee on Inductive Interference by the California Railroad Commission

In the issue of the *Journal of Electricity* for Dec. 15, 1917, on page 543, appeared an extended account of the noteworthy work that has been accomplished by the Joint Committee on Inductive Interference in California. Comment was also made in the editorial columns of that issue on page 538. An effort is now being made to have the greater portion of this valuable data published, parts of which have now gained such international dissemination.

The Joint Committee on Inductive Interference, organized in December, 1912, by the California Railroad Commission and authorized to conduct an investigation of the problem of inductive interference to communication circuits by parallel power circuits has completed its work, after continuously investigating this subject for over five years at a cost of over \$100,000.

Some of the general conclusions have been published at different times during the progress of the investigation, but practically none of the technical data have thus far been made generally available. From time to time during the course of this work, technical reports have been prepared which give the data obtained from the tests and the results and conclusions derived from both the tests and from theoretical studies. Thirty of these technical reports have been selected as being of such general interest and applicability to warrant publication.

In addition to the technical reports the publication will contain final recommendations for rules for the prevention and mitigation of inductive interference and valuable historical matter concerning the investigation with general and technical discussions on the subject.

The book will have a complete index and contain approximately 1000 pages with over 400 drawings and 30 photographs.

The publication is contingent upon obtaining, in advance, a sufficient number of subscriptions to cover the actual cost of printing and binding at not to exceed, and probably considerably less than \$10.00 per set (1 or 2 volumes).

If you are interested in this problem you will find these reports of considerable value. As the number of copies printed will be limited, only those subscribing in advance can be assured of receiving copies in the event the number of subscriptions justifies the publication. Those who place subscriptions will be advised as soon as possible whether the publication will be undertaken and the approximate cost per set.

Materials and Equipment

The report on Cast Iron Pipe of the Manufacturers' Census for 1914 has recently been published and may be obtained from the Bureau of the Census, Washington, D. C.

"Standard Forms for Specifications, Tests, Reports and Methods of Sampling for Road Materials" is the title of a recent report issued by the U. S. Department of Agriculture.

Bulletin No. 98 of the Engineering Experiment Station of the University of Illinois covers the subject of "Tests of Oxyacetylene Welded Joints in Steel Plates," the result of a series of tests conducted by Herbert F. Moore, Research Professor of Engineering Materials.

Cost Accounting for Oil Producers

The Bureau of Mines, Department of the Interior, has recently issued Bulletin No. 158 on "Cost Accounting for Oil Producers" by Clarence G. Smith. This is the first treatise of its kind and is a simple explanation of the methods that may be employed in cost accounting for oil producers, who on account of the peculiar and unusual conditions affecting oil production, require a much different system of cost

accounting than any other class of business men. Mr. Smith says in part:

"Prior to the actual development of an oil property it is difficult to determine the quantity of oil under the property and the rate at which this oil can be brought to the surface—factors that determine the ultimate value of the property. Consequently, there has been much confusion in devising accounting systems that, during the entire life of a property, will show costs and profits from which the producer can determine whether his property is being worked at a profit or otherwise. The Bureau of Mines publishes this report in recognition of a distinct need for a simple treatise on accounting methods adapted to the peculiarities of the petroleum industry."

Trade Bulletins

"Trading With the Enemy" is the title of a booklet issued by the War Trade Board of the United States which lists enemies, allies of enemies and other persons, firms and corporations who there is reasonable cause to believe have acted, directly or indirectly for the benefit of enemies or allies of enemies. Additions to and variations in this list will be published approximately on the 1st and 15th of each month. Since considerable of the data in the "Rules and Regulations of the War Trade Board," which has been distributed very widely throughout the country, has now been superseded by new rulings and lists, the Division of Information of the Board is preparing a "War Trade Board Manual for Shippers," which will contain only data in force at the time of its publication.

Information as to articles which do not require export licences except when shipped to enemy or neutral countries of Europe is to be obtained from Bulletin Vol. I, No. 123 of the Committee on Public Information.

Mining Bulletins

"Blast-Furnace Breakouts, Explosions and Slips, and Methods of Prevention" is the title of a report by F. H. Wilcox, recently published by the Bureau of Mines.

Bulletin No. 74, issued by the California State Mining Bureau, under direction of Fletcher Hamilton, State Mineralogist, shows that the mineral output in California during the year 1916 amounted to \$127,901,610 worth of crude materials. There were fifty-two different mineral substances, exclusive of a segregation of the various stones grouped under gems and of the fifty-eight counties in the state all but one contributed some mineral product.

The seventh annual report of the Director of the Bureau of Mines is ready for distribution. It includes reports of the work done on electrical equipment, and the rules governing the use of electricity in mines.

Handbook of Chemistry and Physics

by Charles D. Hodgman of the Department of Physics and Melville F. Coolbaugh of the Department of Chemistry at the Case School of Applied Science; size 7 x 4½ in.; 482 pp.; published by the Chemical Rubber Company of Cleveland, Ohio and for sale by the Technical Book Shop, San Francisco. Price \$2.00.

A small but comprehensive handbook of physical and chemical data has here been compiled, designed for use in laboratories and elsewhere. Mathematical tables, general chemical tables, formulas and tables covering the properties of matter and heat, hygrometric and barometric tables, the properties of sound, electricity and magnetism, the subject of light, together with a series of miscellaneous tables, physical and astronomical, tables of measures and units, wire tables and others make up the subject matter of the book. The work is extremely comprehensive in a form easily handled or carried in the pocket.

The handbook has recently been adopted by the War Division for the use of the Army Engineering Department and is now used by many universities and colleges.

NEW ELECTRICAL DEVELOPMENTS

(The general reorganization for the new year, the taking of stock and the pressing of other activities mark a quiet interval over the holiday period. The taking over of electric light systems by some of the smaller cities and changes and improvements in electric street railways are the chief items of interest in the Pacific central and northwest districts.—The Editor.)

THE PACIFIC NORTHWEST

TACOMA, WASH.—Tacoma Railway & Power Company will extend its line into Camp Lewis to help in relieving the traffic problem.

SPOKANE, WASH.—Contract for lighting system for the Crescent store was awarded to Doerr-Mitchell Electric Company, at approximately \$4,000.

SEATTLE, WASH.—A contract for 12,406 feet of relay rails with 406 pairs of fish plates was awarded to the Clyde Equipment Company at \$7,681.26.

PORTLAND, ORE.—It is reported that the Southern Pacific Railroad Co. may electrify its line over the Siskiyou mountains in northern California.

TACOMA, WASH.—The city will spend the sum of \$30,000 in procuring four motor cars and six trailers for the municipal railway line on the tide flats.

WENDLING, ORE.—Plans for the immediate erection of a large planing mill here and the gradual electrification of the Wendling plant of the Booth-Kelly Lumber Company are under way.

PENDLETON, ORE.—Pacific Power & Light Company has been granted a fifty-year franchise for operating in the town of Helix. Power and light are to be installed as soon as possible.

TACOMA, WASH.—The shops of the Chicago, Milwaukee & St. Paul Railway at Tacoma, it is reported, will be enlarged. Equipping the railroad to Puget Sound for electrical operation will soon be completed.

SEATTLE, WASH.—Plans are under way in the office of the city architect for the construction of a new substation for the city lighting department at West 49th street and 14th avenue N. W. to cost about \$75,000.

SEATTLE, WASH.—The city council has authorized construction of a substation for the light department in Gilman Park addition and made appropriation for construction of same, amounting to \$20,000.

SEATTLE, WASH.—The Skykomish Power Company has offered to sell to the city of Seattle a power site on the Stillaguamish river near Robe, Washington. This site is said to be capable of producing 40,000 horsepower at a cost of \$800,000.

EVERETT, WASH.—The city has entered into arrangements with Burns & McDonnell, Kansas City engineers, to make a survey and submit reports on a power project to furnish the city with a municipal power plant. The question will be submitted to the voters next year.

FORT FLAGLER, WASH.—The Arrow Electric Company of Seattle has been awarded the contract for installing all electric wiring, transformers, street-lighting systems, etc., for the United States Army cantonments at Forts Flagler, Casey and Worden. About 40 buildings will be erected.

KELSO, WASH.—The North Coast Power Company is contemplating an extension of its transmission line from Kelso to the new pumping plant to be erected near Freeport, to reclaim several hundred acres of land lying within the bend of Horseshoe Lake.

PORTLAND, ORE.—The Commission of Public Docks is receiving proposals for power equipment to be used in the new grain elevator at the St. Johns terminals. The equipment to be purchased includes 42 motors, ranging in size from 100 h.p. to smaller sizes and three 2550 h.p. k.v.a. transformers.

ROSSLAND, B. C., CANADA.—Preliminary work has begun on the high power line of the West Kootenai Power Company from Rossland to Cooper mountain near Princeton. The main line extension will be about 180 miles long. It is reported that the cost of the new line with laterals and sub-stations will be from \$2,000,000 to \$2,500,000.

NEWPORT, WASH.—George E. Worthington, Spokane special master, recently sold the properties of the Northern Idaho & Montana Power Company, including those here, at Sandpoint, Idaho, and of the Oregon Power Company at Eugene, Ore. The property was bid in by John H. Roemer, 208 South LaSalle Street, Chicago, representing the reorganized companies, at \$5,016,773.

SEATTLE, WASH.—Utilization of the \$375,000 remaining unsold from a bond issue of \$800,000 authorized in 1914 for the purchase or paralleling of the Seattle & Rainier Valley line, for the construction of an elevated railroad on Railroad and Whatcom avenues from Washington street to Spokane street, will be submitted to the voters on March 6th. City Engineer Dimock estimates the cost of the elevated portion at \$330,000 if of wood and \$1,500,000 for steel construction. The building of this line would make it possible for the city to operate its Lake Burien line over the elevated line to First avenue South and Washington street, connecting with the present Division A at Third avenue and Stewart street by exercising common user rights on Fourth avenue and Washington street.

THE PACIFIC CENTRAL DISTRICT

SAN RAFAEL, CAL.—The Pacific Telephone & Telegraph Company has been granted a franchise to operate in this city.

HANFORD, CAL.—The Peoples Ditch Company will install an electric light and power plant at the headgate of its irrigation system.

HANFORD, CAL.—At a cost of \$11,400, the city trustees have signed up with the H. G. Lacey Co. for lighting the downtown electric light district for two years.

STOCKTON, CAL.—Suit has been commenced by the Pacific Gas & Electric Company to condemn lands for a right of way for a power line, including steel towers.

OAKLAND, CAL.—The city council has received a communication from the Commission Merchants' Protective Association asking for more street lights on lower Franklin street.

REDDING, CAL.—Fire of unknown origin destroyed the planing mill, electric plant and boiler house of the Shasta Land and Timber Company. The loss is estimated between \$60,000 and \$70,000.

FRESNO, CAL.—The board of trustees will receive bids up to January 7th for the construction of an electrolit street lighting system upon portions of each side of Fresno street and Kearney avenue.

REDDING, CAL.—William A. McEwan of this city has been granted a permit to use for electric power purposes 25 second feet of the waters of Boulder Creek and Little Boulder Creek in Trinity county, Cal.

OROVILLE, CAL.—Deeds conveying about 160 acres of land in the section through which the Great Western Power Company will build its large canal and power plant near this city have been filed for record by F. F. Ford.

PARADISE, CAL.—Engineers of Paradise irrigation district expect water will be turned into the system in a few

days, as pipe-laying is about completed and the main from the head of the storage reservoir is ready to carry water to the distributing ditches.

SANTA ROSA, CAL.—Application has been made to the State Railroad Commission by the California Telephone & Light Company of Santa Rosa for permission to extend its transmission system in order to serve Summer Home Park and vicinity in Sonoma county.

PETALUMA, CAL.—The mayor reports that the electric light company has refused to comply with the request of Manager Weber to place temporary wires in the electrolier conduits to light Kentucky street, so it seems the street can not be lighted until electroliers are installed.

FRESNO, CAL.—The executive committee of the Pine Flat project of the Kings River conservation district has arranged a meeting with A. E. Chandler of the California Water Commission for the purpose of discussing the measurement of the waters of Kings River and the canal during 1918.

UKIAH, CAL.—The Snow Mountain Water & Power Company of Ukiah, which operates a hydroelectric power plant in Mendocino, Lake, Sonoma and Napa counties, has filed an application for an extension of time within which to comply with the statutes concerning the standardization of pole lines.

MERCED, CAL.—By the vote on the preliminary resolutions of intention to declare the light and water systems of Merced city to be public necessities and to acquire the municipal improvements, the city trustees decided to proceed with further steps for municipal ownership of the light and gas plants, but defeated the plan for the city water system.

BAY POINT, CAL.—Surveys are being made by the Great Western Power Company, 14 Sansome street, San Francisco, for the purpose of supplying energy to the plant of the Pacific Electro Metal Company at Bay Point. The power company has a contract to furnish 4000 kw. to operate the first unit of the chemical plant now in course of construction.

TAYLORSVILLE, CAL.—The Great Western Power Company has completed its power line to Walker copper mine, above Genesee. Engineer L. P. Cornell has closed all the camps along the line and shipped the equipment to San Francisco. The towns of Taylorsville and Genesee have been connected with separate transformers, and are now being wired for power.

AUBURN, CAL.—The big tunnel of the Pacific Gas and Electric Company, near Newcastle, has been completed. It is nearly a mile long and will carry some 14,000 inches of water after it leaves the Wise power house at that point. The water will then be picked up by smaller lateral ditches and scattered over the large orchard area around Newcastle, Penryn, Loomis and Rocklin.

ALAMEDA, CAL.—The Southern Pacific Company is planning to construct a \$60,000 high power line from its Fernside power house to Webster street, Alameda, and to remove the existing "high line" from Lincoln avenue, thereby improving the appearance of the latter thoroughfare and eliminating danger to the increasing traffic. The new line will carry power from the main plant to substations at West Oakland and Thousand Oaks. E. H. Miller is the engineer in charge.

BYRON, CAL.—The Sierra & San Francisco Power Co., which supplies this district with electricity for power and other purposes, is spending \$25,000 in installing a complete system to take care of the demands of irrigation and other needs. The new line of 17,000 volts extends from pumping plant No. 1 of the Byron-Bethany system to plant No. 4, near the Brentwood border, a distance of about 12 miles. Later the local distribution lines of Byron and Brentwood will be rebuilt.

MODESTO, CAL.—The Sierra and San Francisco Light & Power Company is rushing the installation of equipment in its local plant which, when completed, will more than triple the present distribution. The improvements are being made at an expense of approximately \$30,000. The three 350-kw. transformers will be removed and four others of 1000 kw.

power will be installed. Three of these will be in constant operation, the fourth being used in cases of emergency. The new equipment will be ready for operation about April 1 of next year.

FRESNO, CAL.—The United States Reclamation Service and the California State Water Commission will co-operate in taking measurements during 1918 of the flow of the water in Kings River as a means of further plans for the construction of the Pine Flat reservoir, according to announcement made at the meeting of the executive committee of the conservation district and representatives of the civic organizations throughout the three adjoining counties. It is the aim to have the government gaugers here by the first of the year and work started within a short time thereafter.

THE PACIFIC SOUTHWEST

SAN DIEGO, CAL.—Plans are being considered to equip the La Jolla Beach Railway line for electrical operation.

LOS ANGELES, CAL.—It is expected that work will be started shortly on the erection of ornamental poles on Broadway.

LOS ANGELES, CAL.—The Lamanda Park board of trade is at present concerned with a project for lighting the entire district with ornamental electric lights.

LOS ANGELES, CAL.—Pacific Electric Railway, Pacific Electric Building, plans to build an extension from Santa Ana to San Diego. J. McMillan is the general manager.

BISBEE, ARIZ.—A city council election will be held to vote on a \$375,000 bond issue to build an electric-lighting system and gas manufacturing plant, also a water system.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Company has filed with the California State Railroad Commission an application for authority to issue bonds to the amount of \$165,000.

WILLIAMS, ARIZ.—The town council has decided to purchase a practically new plant at Goldfield, Idaho. The town will thus be provided with electric service in a short time and at a reasonable cost.

ESCONDIDO, CAL.—Surveyors who have been staking out the line from Escondido to San Pasqual for a high power line for the San Diego Consolidated Gas & Electric Company have completed their work. Building of the line is to be started at once.

SAN BERNARDINO, CAL.—The \$50,000 contract for the construction of the Pacific Electric car barns, tracks, etc., in this city, has been let to a contractor from Los Angeles, according to H. E. DeNyse, engineer of the eastern district of the Pacific Electric.

FULLERTON, CAL.—The Pacific Electric Co. has about completed its line to Fullerton, and there are rumors to the effect that it will be but a short time before the company may consider the matter of extending the line on south to Anaheim and possibly later to Santa Ana.

EL SEGUNDO, CAL.—The Southern California Edison Company has applied for a 40-year franchise to erect and maintain poles, conduits, cables, wires, etc., for distributing electrical energy in El Segundo. Sealed bids will be received for the franchise up to January 2nd.

SAN DIEGO, CAL.—Plans for the construction of an electric railway into the Mountain Empire from Lakeside to Santa Ysabel, a distance of about 22 miles, is under consideration by the San Diego Southeastern Railway Company. E. J. Burns of San Diego is manager.

PRESCOTT, ARIZ.—The consensus of opinion among business men here seems to lean towards better lighting for the city. The president of the Chamber of Commerce has appointed a committee to look into the matter. The Arizona Power Company has offered to install the system at cost plus 10%.

PHOENIX, ARIZ.—Architects of this city have been commissioned to prepare plans for all buildings required for a town of 2000 population for the new townsite at the smelter

of United Verde Extension Mining Company at Verde, Ariz.; also for sewer and water systems and an electric lighting system. The estimated cost of building and general construction work is about \$2,000,000.

LOS ANGELES, CAL.—The Pacific Electric Company will install a "Y" between the main-line Glendale tracks at Semi-Tropical Park, for the Edendale local cars, and two sidings on W. 16th Street, one near Berendo Street and the other between 2nd Avenue and Arlington Avenue. Additional track and three cross-overs will be installed on the Long Beach Avenue right-of-way between 8th and 14th Streets. Work is to begin at once.

YUMA, ARIZ.—Secretary Lane told a delegation from the Imperial Valley irrigation district, at Washington, D. C., that they would be permitted to connect their irrigation canal with the Laguna dam near Yuma, Ariz., provided they bore the expense. However, he suggested that before this construction was undertaken, the people of the district be allowed to vote on a proposal to build a series of flood dams in the Colorado river from which the entire district could be irrigated.

JUAREZ, N. M.—Work on the hydro-electric development of the Rio Grande Light, Heat and Power Company, on the Rio Grande in New Mexico, will start shortly. The new plant will have a capacity of 25,000 horsepower, with an annual output of approximately 100,000,000 kilowatt-hours. Nearly 150 miles of transmission lines will be built, and contracts already obtained call for 34,000,000 kilowatt-hours per annum at rates ranging from $1\frac{1}{4}$ to 3 cents per kilowatt-hour.

TUCSON, ARIZ.—Authorization for \$50,000 worth of improvements in the plant of the Mountain States Telephone & Telegraph Company on the north side of the city has been secured by R. L. Burgess, district manager. This will be a 1918 project, and work begun as soon after the first of the year as possible. The improvements will consist of replacing the old cable on University Boulevard and removing poles from the streets to alleys wherever feasible. A new copper circuit to Hayden will be put in shortly and a new copper circuit to Casa Grande also will be installed.

LOS ANGELES, CAL.—Engineer Scattergood has submitted a report to the Public Service Commission showing the progress of the city's power development work, and emphasizing the necessity of providing funds with which to develop power sites and make it impossible for the city to lose those sites through non-development work. It is stated that if people could realize the importance of rushing completion of power plant No. 2 and the proposed plant in Franklin Canyon district, they would vote the necessary power bonds. At least \$100,000 should be provided during the next six or eight months.

LOS ANGELES, CAL.—Coachella Power & Irrigation Canal, through F. M. Merrill and W. B. Baker, of this city, has filed application with the State Water Commission to install an irrigation system in the Morengo Valley, San Bernardino county, to cost \$4,900,000. The company plans to irrigate 25,000 acres and to generate 30,000 horsepower, hydro-electric energy, from two power plants above the Whitewater River Valley, to which the waters will be led for irrigation purposes in 65 miles of canals and pipe lines. Morengo Valley will be utilized as a storage reservoir with a capacity of 150,000 acre feet.

INTER-MOUNTAIN DISTRICT

SHELLY, IDAHO.—Installation of an electric lighting system is planned here for the near future.

GREAT FALLS, MONT.—Montana Power Company will erect a two-story and basement 90 x 116 foot building at a cost of about \$65,000.

HAILEY, IDAHO.—At an election held recently the proposal to issue \$100,000 in bonds to establish a municipal electric-light plant was defeated.

ROUNDUP, MONT.—A telephone line is to be constructed north from this place at a cost of about \$15,000. Fred Sadler is president of the company having the matter in hand.

HAMMETT, IDAHO.—The Public Utilities Commission of Idaho has recently allowed the Idaho Power Company to remove and dismantle the Clark Extension of its Hammett distribution system.

BOISE, IDA.—An ordinance has been passed confirming the creation of Local Improvement District Number 2 and providing for a system of ornamental 250-candle power nitro-filled mazda lights on a number of streets.

WINNEMUCCA, NEV.—The Golconda Telephone & Power Company is installing two toll lines out of Battle Mountain. One of the lines goes south to the Copper Basin section and the other east toward Argenta.

MISSOULA, MONT.—The Northern Pacific Railway Company is to install a railway telephone system for communication between headquarters of the Rocky Mountain Division located here and at Livingston. Spokane and coast points will also be included.

COEUR D'ALENE, IDAHO.—The city council has voted to offer the Consumers' Power Company and the Kootenai Power Company, which furnishes electricity for lamps and motors in Coeur d'Alene, a contract to furnish the service for six years, instead of twelve years as asked by the companies.

KALISPELL, MONT.—The property here of the Northern Idaho & Montana Power Company, including the Big Fork power plant, telephone and power lines and real estate were sold recently at public auction to Robert J. Graf for \$563,166. The Northern Idaho Company, a Byllesby concern, was put into the hands of a receiver last January.

RENO, NEV.—Construction of a power line, 15 miles long, to carry current from the end of the Great Western Company's Indian Valley line to the Walker Mines Company, near Portola, Cal., has been completed. Transformers are being tested and it is expected that current will displace steam plants in milling operations and part of the mining.

KALISPELL, MONT.—The city council has adopted a resolution, on the recommendation of the light and water committee, to provide the city with a special lighting district that will embrace the whole city. The cost of the improvement is placed at \$14,500, and the cost of maintaining the lamps and supplying the electric current therefor for the first year is estimated at \$11,900.

HELENA, MONT.—According to Willis I. Egleston, district counsel of the U. S. Reclamation Service, with headquarters in Helena, one of the highest dams in the world will probably be built in the northern part of Lewis & Clark county, 30 miles northwest of Gilman, to fully develop the Sun River irrigation project. The exact location of the dam has not yet been decided, but will depend much on the amount of money available for its construction.

MONTICELLO, UTAH.—The state public utilities commission has ruled that the Independent Telephone Company of Monticello pay the Midland Telephone Company a maximum connection toll of 75 cents a month on each subscriber. A protest was entered with the commission by the Independent Company because about a year ago the Midland Company had raised its "switching" charge from 50 cents to \$1 per month per subscriber. The ruling is in settlement of the controversy which thus arose.

SALT LAKE CITY, UTAH.—Plans for the control of the Humboldt River, in Nevada, making possible the irrigation of thousands of acres, were announced by R. A. Hart, of the irrigation engineering department of the United States, following his return to the city after an exhaustive investigation in Nevada. The plans which Hart will submit to the Government call for the construction of a series of immense concrete reservoirs to hold up the surplus water caused by spring floods. If carried out, Hart said that the project would be one of the largest undertaken by the Government in the West.

Ad-itorial Comment

(The best of the theories in the editorial pages of a technical journal appear as practice in the advertising pages. A good knowledge of the latest practical developments is gained from reading the advertisements. In this issue, many of the editorial thoughts on safety first are embodied in the apparatus illustrated and described in the display advertising pages. On this page are briefly summarized the salient features of each new advertisement.—The Editor.)

American Electrical Heater Co. tells of a remarkable test withstood by an American Beauty electric iron for over seven years without burning out.

Sprague Electric Works emphasizes the fact that immediate delivery can be made of B S S single phase motors, $\frac{1}{4}$ to 1 h.p.

Hurley Machine Co. employs good contrast in displaying a Thor washing machine,—one device wherewith the electrical man can help the patriotic housewife so as to meet the call for labor.

Hubbard & Company shows six of a large series of insulator pins which are available for varying line construction requirements.

National Lamp Works brings out the service which is back of their guarantee of Type C National Mazda lamps.

The R. Thomas & Sons Co. shows its No. 2120 insulator for 20,000 volt service.

Pacific States Electric Co. extends the season's greetings and good reason for confidence in the electrical business during 1918.

Garland-Affolter Engineering Co. shows construction details which contribute to the efficiency of Howell polyphase and Peerless single phase motors.

Federal Sign System (Electric) brings out the possibilities of miniature lamp letter electric signs as business builders.

National Carbon Co. Inc. urges co-operation of motor users with its engineers in providing the correct brush for each kind of service.

Sangamo Electric Co. lists the various types of switchboard and service meters wherewith every electrical need can be met.

The Locke Insulator Mfg. Co. shows the Victor No. 5090 as a new insulator design for 60,000 volt service.

Edison Storage Battery Supply Co. presents a simple diagram of connections showing how Edison storage batteries are used for emergency switchboard lighting,—a very important safety precaution.

Chicago Fuse Co. lays stress on the double dependence that may be placed on "Union" fuses.

General Electric Co. advertises insulated wires and cables, voltage regulators and a safety first switch.

Baker-Joslyn Company is noted as wholesale distributors for "V.V." safety switches.

Ward Leonard Electric Co. lays emphasis on the expert advice which, as resistance specialists, it is prepared to furnish.

The Cutler-Hammer Mfg. Co. features its C-H 9116 starting switch which protects both the workman and the motor, thus giving double safety.

Century Electric Co. advises that voltage fluctuation caused by the starting of small motors can be eliminated by installing Century motors.

The Electric Controller & Mfg. Co. describes a push-button, remote control, automatic starter for a.c. motors that does away with electrical fire hazards.

The Electric Storage Battery Co. calls special attention to the application of storage batteries to 24-hour service for small central lighting and power plants.

Westinghouse Lamp Co. illustrates the great extent of its lamp selling service by a two-page map of the United States showing the location of its central distributing points.

Westinghouse Electric & Mfg. Co. gives general and detail views of a 45,000 k.w. tandem compound Westinghouse turbo-generator.

Allis-Chalmers Mfg. Co. shows the assembly of one of six 51,000 h.p. turbines and the factory where such assembly is made.

Wagner Electric Mfg. Co. employs a 19-year-old motor driving a printing press to illustrate dependable service.

Robbins & Myers Co. explain the selling helps and general advertising used to help the electrical dealer sell fans.

A prize of \$5.00 is offered by the publishers for the best letter telling which, in the writer's opinion, is the best display advertisement in this issue. In stating the reasons for preference take into account such points as attention-compelling value, specific interest, general appearance, timeliness, etc. Letters should not exceed 150 words in length and should be received prior to Jan. 25th. This contest is open to any reader. Announcement of the winner will be made in the issue of Feb. 1, 1918. Address communications to The Editor, Journal of Electricity, Crossley Bldg., San Francisco.

JOURNAL OF ELECTRICITY

VOL. 40 NO. 2

SAN FRANCISCO, JANUARY 15, 1918

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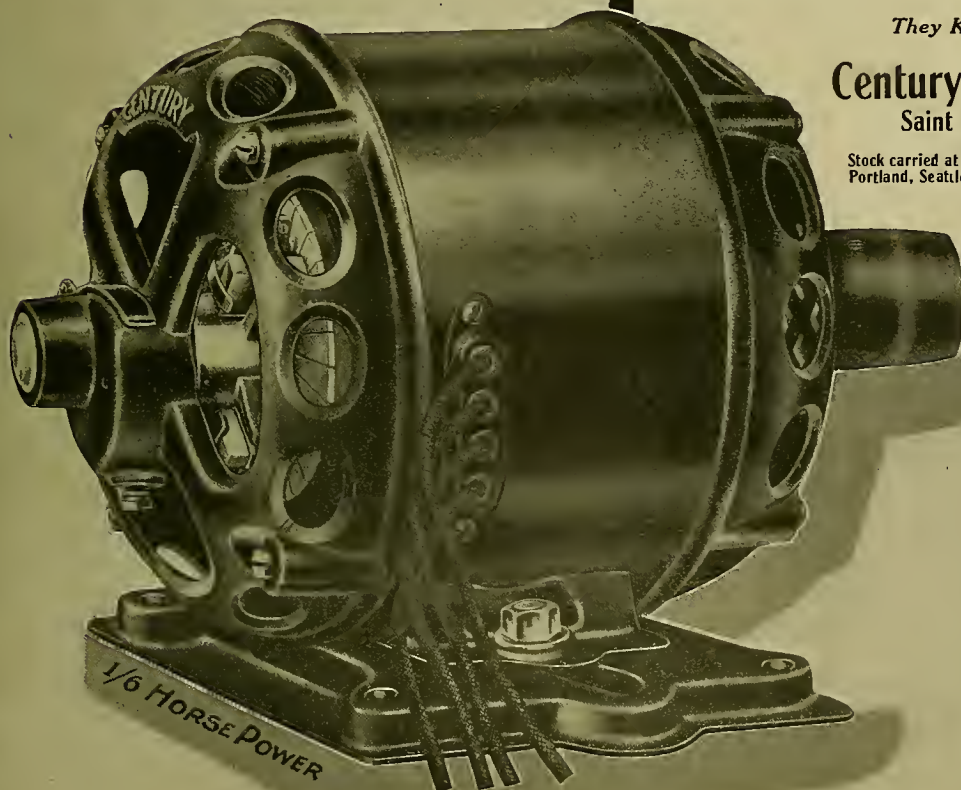
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VOLUME 40

SAN FRANCISCO, JANUARY 15, 1918

NUMBER 2

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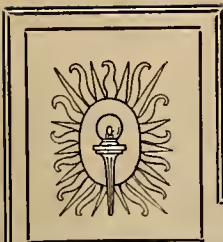
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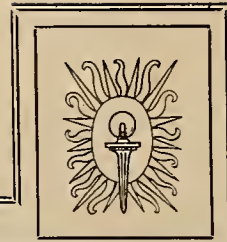


HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—V

Five hundred million tons of coal and two hundred million barrels of oil annually constitute the gigantic drain upon the natural resources of the nation. The West, with its wonderful water powers, has already called forth the admiration of the world. With reasonable governmental encouragement for further power development upon the public domain and reasonable extension of credit through the Federal Reserve Banks, the ultimate development of the twelve million horsepower west of the Rockies can perform a service for the nation and for the lifting of human burdens beyond the imagination of the human mind.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, JANUARY 15, 1918

Number 2

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FOR GREATER SERVICE

In times before the war, economists were wont to say our industry did not achieve one-fourth the output that it might. From the trials and strain and burden of these years, let us at least attain a measure of efficiency, that the portion of this nation's work for which we are responsible be better done with truer spirit than before. As the message of electricity in shop lighting or in chaining water powers is always "greater service," let us then as electrical men make this a motto with which to meet the greater burdens of the world.

That the editorial utterance of the Journal of Electricity, as set forth in the issue of January 1, 1918, representing, as it does, the urgent sentiment of the West, has been so quickly followed by the Administration, is indeed a source of gratification to all.

The Journal and Water Power Legislation

It is with deep interest that men of the electrical industry in the West have noted the recent congressional message of the President in which he has urged the immediate consideration of water power measures, placing their importance second only to the discussion of the railroad issue.

Electrical contractors and dealers of the West are to be congratulated upon the big things that they have done during the past two years. Theirs is now the strength that comes from organization. The get-together spirit that originated in California has spread until today there are also strong associations in British Columbia, Washington, Utah and Nevada.

The Electrical Contractors Dilemma

Furthermore, there is a close co-ordination of effort on the part of all these organizations to their common good. By the meshing, balancing and compensatory influences of the men in these associations a rapid elimination is being made of lost motion, friction, waste, futility and dissatisfaction.

Most of this effort has been directed along ways and means for improving the status of the electrical dealer. The power companies have given tangible recognition of his importance as a load builder. Many of them have turned over the sale of all lamp socket devices to the retailer, or contemplate so doing as soon as he demonstrates his ability to handle it. Others are at least selling on a parity of prices. And as between contractor-dealer, jobber and central station, there is now reciprocal action and harmony of feeling.

In California, for instance, this month sees the

start of a plan probably destined to be applied all over the country. The several interests represented in the Pacific Coast Section of the National Electric Light Association, have contributed to a fund of twelve thousand dollars, which is to be expended this year in a co-operative educational and merchandising campaign under the direction of a representative advisory committee. With "better business methods" as the immediate slogan, this will ultimately result in the handling of all appliance retail sales by the electrical dealer.

But with all this work in aid of the dealer there is need of similar study and the development of some plan for improving the conditions under which the electrical contractor is laboring. The tide of new building is at low ebb. War demands have halted the construction of residences and office buildings. Electrical construction in new industrial plants is performed under the direction of the management. Most contractors see little new work in sight.

The electrical contractor is consequently face to face with a most serious situation. Something must be done, and done quickly, if he is to withstand this period of business drought. In the hope of stimulating thought and discussion, a few constructive ideas seem in order as a means for improving the situation.

In the first place, it would seem opportune for central stations to discontinue the practice of running the service lines into consumers' premises. The custom has already caused much useless duplication. In many cases competing companies have run two and even three services into one building, while only one service is in use. The unused circuits represent a great waste of labor and material. All this might be obviated if the contractor were paid by the consumer to connect his premises to the distribution lines.

On the other hand, the adoption of a better system of estimating labor costs in contract work would save the contractor many a dollar on those jobs he does get. Every job estimate should carry with it

an itemized schedule of labor costs as well as of the cost of material. A few of the more progressive contractors possess this information, but guard it jealously as their most valuable stock in trade. By so doing, however, they encourage the ignorant bidder, and thus demoralize their own business. An educated competitor makes for fair competition. By letting out the facts about the unit cost of labor for various classes of construction, a contractor will ultimately help himself far more than he may help his competitor.

Finally, the electrical contractor is the logical electrical merchant. He is well informed on the technical side, and better able to advise the purchaser than is a mere sales person. With the help of the intensive selling campaign now under way, any contractor will find a profitable side line in the sale of appliances. Thus he can tide over a lean period and maintain his position in the industry.

There is no man but sometimes thinks that he is not getting ahead fast enough. He becomes dissatisfied with his job. He sees other men advance while he stands still. And usually he blames everyone and everything but the right one. Nine times out of ten he himself is alone at fault, as honest introspection will show.

A Man and his Job

So when a man becomes discontented, just let him take stock of himself. If he is lazy, then let him drive himself into habits of industry. If his brain is sluggish, then let him quicken his reasoning faculties by practical study. If he lacks self-respect, correct the degrading thought or action that causes it. Let him set a high value on himself, live up to that valuation, and others will accept him at his own value.

Then let him study his job and its relation to the job ahead. Let him find ways for doing it better and apply those methods in his daily work. Let him study successful men and note that their success is fundamentally due to strength of character. They have the power of concentration, the power of industry, promptitude in beginning work, method and accuracy and dispatch in completing work, perseverance, cheerfulness, self-control and self-denial. All of these qualities they have developed, as any man can likewise, by the constant discipline of always doing the nearest duty well. These lead to broadness of mind, intensity of feeling and strength of will. These are the stuff from which great men are made.

But above all else this personal analysis must be honest and sincere, as such honesty is the basis of integrity, which is the fundamental attribute of the successful man.

And yet a man may possess all these qualifications and still be so limited by the nature of his work that he is making no apparent progress. This is the one time out of ten when the man may not be at fault. In a chess-game this condition is known as a stale-mate. The pieces and pawns have so been placed that neither player can win, no matter how long they play. So they set up their men and start a new game. Likewise, after a man has worked under the same mechanical routine for three or four years without even a prospect of advancement, and honest analysis shows that the fault lies not within himself,

then let him call "stalemate" and set up his mental chessmen with another organization.

Heretofore extensions of electric service have been predicated on the requirements of convenience and necessity. The central station salesman has emphasized the convenience of electricity when soliciting new business. Electric power has made its great forward strides in public estimation as a convenience rather than as a necessity.

Gradually, however, yesterday's convenience has become today's necessity. Electricity does the world's work so much better, so much more effectively and so much more economically than the agents it displaced, that people are beginning to feel that they cannot get along without it.

And now, with a fuel shortage confronting the nation, central station power, especially when generated hydro-electrically, is well-nigh indispensable. Gas, oil and steam engines are being cast on the scrap-heap wherever electric service can be had, and the power companies are suffering from an embarrassment of greater demands than they are able to supply.

In such cases the wisest course would seem to be that followed by other industries under similar emergency. The suggestion is here made that a priority system be established. When a possible consumer already has some other form of prime mover, he should give way to the one who has not. Irrigation pumping for the raising of needed food products should take precedence over other demands. An industry making the sinews of war should be served before those turning out luxuries. Necessity should supersede convenience in the making of power contracts.

To accomplish this object will require the approval of regulating commissions and the hearty cooperation of consumers. It is none too soon to start a campaign of education to this end so that the public may understand and appreciate the reason for it. For with the lamentable shortage of hydro-electric power a priority system seems inevitable.

The ever closer commercial and engineering relations with the West and the great commercial and industrial districts of the Far East make a discussion of general labor conditions of the Orient of much timely interest to men of the electrical industry. Hence a statement of some of the characteristics of these peoples will at this time not be amiss.

General Labor Condition in the Orient

At no place outside of Japan does the traveler find that keen endeavor to have the world run by clock-work. In Shanghai, Hong Kong, and in Manila, business men seem not to be able to overcome the languid bearing down of the humid climate. Business hours are short and the hours of pleasure and relaxation lengthened as much as possible. In Hong Kong tea is served in bed at seven, breakfast in the dining room at nine. The business man arrives at his work at ten to quit again at twelve. Upon completion of tiffin (the noonday meal) and his usual siesta he returns to his office at two to quit again at four. Then to the club, the sailboat or other sport until six when he has

afternoon tea, followed by a hearty dinner at eight o'clock in the evening. In the latter interim between six and eight many of the social functions of this great English metropolis are consummated.

In Japan, especially among the local merchants, things are not so. Hours are long and the world moves by clock-work.

The promptness of the train service throughout Japan leads the traveler to see if this is not a reflected trait of the Japanese. Upon careful observation one comes to the conclusion that the Japanese as a nation are more prompt in meeting the exact time of their business and social engagements than any other people. Perhaps it is their ceaseless activity. At any rate clocks are seen on all sides and the entire nation runs simultaneously with their exact movement and in perfect phase. In a word, in electrical parlance, the angle of lag between the time of appointment and the actual appearance of the parties to the engagement is zero.

Drunkenness is quite infrequent in Japan. While beer seems to be sold in increasing quantities, the streets are void of any drunken sots, at least visible to the tourist. The native drink, known as "sake," is made from rice and very quickly intoxicates the imbiber.

The streets of the Japanese city are always crowded with the curious. A foreigner stopping to take a picture will soon find a hundred on-lookers gazing with inquiring eyes at every movement. These crowds, however, are always orderly and though one may suffocate from the numbers huddling around, it is not that they are trying to harm you, but that they too are humanly curious and are trying to find out as much about you, as you are about them.

This curious yet orderly appearance of the citizens of both Japan and China is quite characteristic of these nations, and their orderly behavior is in a measure due to their freedom from intoxicants. The total lack of intoxicants and also the total doing away of opium is making a much higher grade of labor possible throughout both nations.

In Manila the smoking of cigars is the striking feature. Native men and women appear upon the streets on all sides smoking long cigars. The native Philippino does not seem addicted to drink. His chief drawback is his "lucky-dazzical" outlook on life.

The natives of the Philippines are over zealous for religious display and are passionately fond of cock-fights. The holding of the latter form of entertainment is limited by law to Sundays and holidays. This is done not so much to improve the moral tone of the native as to make room for some days of the week in which he is supposed to work. American baseball is

fast displacing the barbarities of the cock-fight, although from the enthusiasm displayed and the crowded attendance at the cock-fight as at present staged in Manila some years will pass before this smouldering passion for the excitement of the cock-pit will die in the Philippino's breast.

It is to be said to the Philippino's credit that this so-called "lucky-dazzical" spirit is not entirely his own fault. The humid drowsy atmosphere of the islands is laden with many disease bearing germs which have made their imprint upon his constitution. To the credit of the American occupation it may be said that the future is far brighter for a clean, intelligent, healthy citizenship among the laboring classes. Even today conditions are far better than at the time of the American occupation of the islands and another generation will undoubtedly see a regenerated class of optimistic natives, healthy, active, and courageous to meet their national problems.

In some of the larger ports along the Asiatic Coast the easy getting of strong drink has deteriorated the efficiency of the laboring classes. Especially is this true among the native skilled mechanics.

In Hong Kong this is especially true. When free from drink, however, the native mechanic of Hong Kong is industrious and most efficient for the Oriental class of labor. The great drydocks of the Orient are here located which have been constructed largely by local mechanics.

In cases where dependable skilled labor is absolutely necessary, the engineer should import his foremen and head men from his native country. This has been the universal experience of the great and successful syndicates operating in the oil fields of Burma and the gold mines of northern China and southern Siberia.

Foreign skilled labor in the oil fields of Burma in the nature of machinists work from 6 to 10 in the morning and from 1 to 5 in the afternoon. The company which is a British syndicate is liberal with men and money and gives a return trip home every two years with all expenses paid.

In conclusion, then, it is to be said that common labor is cheap throughout the Orient, especially in China; that so long as the natives are kept free from intoxicants and opiates the labor is reasonably efficient but in all cases, engineers and construction companies should bring with them an ample corps of well trained, fully experienced, dependable men to act as foremen and bosses. These men should be well-paid and of such a nature that every confidence may be placed in them so that they may feel the weight of the responsibility resting upon them looking toward the success of the enterprise at hand.

THE NEW JOURNAL SERVICE: There is a crying need at the present time to show how the upbuilding of the West in the development of more water power, the establishing of new industries and the extension of agriculture are necessary national issues and should be given every national aid possible—especially should the Federal Reserve Banks be authorized to endorse notes for the extension of power supply and the handling of needed industries when approved by the regulatory bodies. Again, existing laws should be modified so that power permits on the public domain be at once made available for development. A series of articles forcefully setting forth these features are now under way by men who are competent to write authoritatively on these subjects. The first of this series, *The Upbuilding of the San Joaquin Valley*, will appear as the leading feature of the issue of February 1, 1918. How electricity has become an indispensable factor in the commercial, industrial and agricultural life of the West and how its further development and encouragement in the West is a national necessity will be beautifully portrayed in this series of articles throughout the year.

PROBLEMS OF FACTORY LIGHTING

BY ROMAINE W. MYERS

(The speeding up of production processes by means of more adequate shop lighting is always a live subject with electrical men, but today it has come to be one of the important war services. This article on the elements of successful illumination as applied to the shops of the Judson Manufacturing Company of Oakland, Cal., is therefore, of particular and timely interest. The author is a consulting electrical and illuminating engineer of Oakland and the local representative of the Illuminating Engineering Society.—The Editor.)



CRANE RUNWAYS AND POURING FLOOR—Fig. 1
The pictures are views of the illumination in the Judson Manufacturing Company's plant

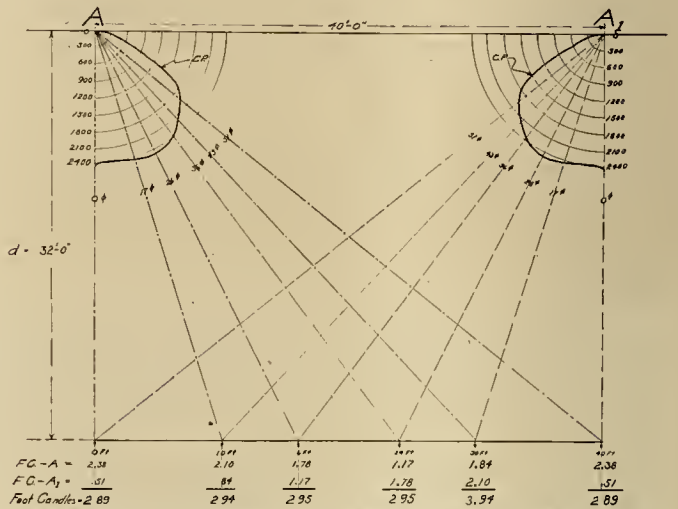
THE services of lighting men in speeding up production are today urgently needed by the government. From the standpoint of the manufacturer, a saving of many times the expense can be made by the correct application of the principles of illumination. At this period of the year there are more hours of darkness than daylight. The demands of the war require all work to continue for the full 24 hours of the day. It behooves all lighting men to help in the stimulation of the maximum amount of production.

The importance of proper lighting for factories is a recognized fact. The states of New Jersey, Pennsylvania and Wisconsin have state laws requiring certain definite intensities of illumination for various classes of work. The national application of the Industrial Lighting Code of the Illuminating Engineering Society is only a matter of a short time. This will produce a unification of lighting methods of great benefit to all concerned.

Good lighting reduces accidents, promotes greater accuracy in workmanship, increases the production for the same labor cost, causes less eye strain, greater contentment of the workers and more order and neatness in the plant. One factory manager remarked after a new lighting installation that he had only one

fault to find and that was the system showed up all the dirt and junk in the shop. It is unnecessary to state that this is a cleaner shop.

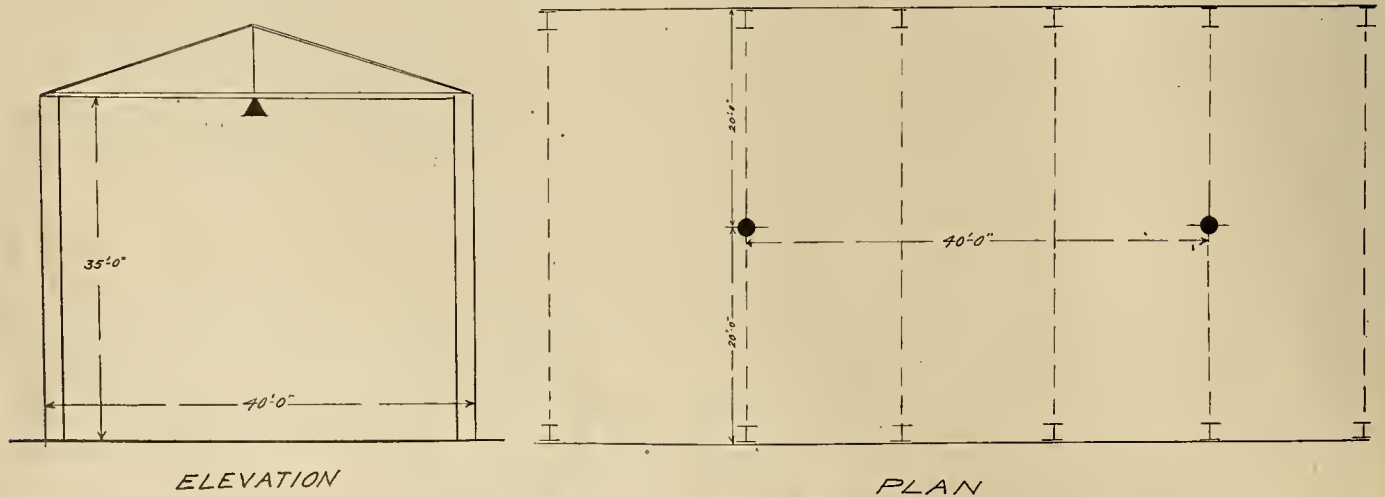
Statistics covering the iron and steel industries of the United States from 1905 to 1910 show 40% of accidents occur at day and 60% at night. In yards



EFFECT OF MOUNTING AND SPACING FACTORS—Fig. 3
By the predetermination of the resulting illumination in foot candles, an almost absolute uniformity of illumination can be secured on the working plane.

having deep shadows 30% of accidents occur during the day and 70% at night. Actual experiments have found 25 % of these accidents were avoided by correct illumination. According to the U. S. Census Department, with a manufacturing spoilage of \$150,000,000 a year 20% is caused by poor lighting.

It is an actual loss to the factory manager to have poor light. Instances have been noted where time was lost to the amount of two hours per day due to im-



PLAN AND ELEVATION OF ILLUMINATION—Fig. 2
The selection and spacing of reflectors used was determined by the use of curves similar to those shown in Figure 3



AN EXAMPLE OF YARD OR ALLEY-WAY LIGHTING

The reflectors are Benjamin of the flat type with 200-watt Type "C" Edison Mazda lamps having a mounting height of 20 ft. and an average spacing distance of 80 ft. Note the evenness of illumination and the absence of shadows. Twenty per cent of the spoilage and twenty-five per cent of the accidents in manufacturing plants are due to poor illumination. In yards and alleys similar to the one here shown where shadows are apt to be particularly black, seventy per cent of the accidents occur at night.

proper light. If good light will add an average of one-half an hour per day to the output these thirty additional effective minutes represent an increase in output of five per cent, brought about through an expenditure equal to one-half of one per cent of the wages for improved lighting, or a saving equal to ten times the expense.

The illustrations accompanying this article show actual night photographs that have not been retouched of several lighting installations at the steel manufacturing plant of the Judson Manufacturing Company, Emeryville, Cal. The accompanying diagrams show the mounting heights and spacing of units.

The above are given as examples of the most severe conditions imposed, the nature of the work causing the settling of considerable oily dust, thereby continually leaving dark surfaces where the reflection coefficient is nil.

With the drawback of no light colored walls or other objects to help the illumination, one should be more careful as to the spacing and mounting of lighting units. A safe way is to use the point by point method.

Fig. 1 is a night photograph of the crane runways and pouring floor of the open hearth building. This has a floor space of 10,240 square feet, seven 750-watt Type C Edison Mazda lamps being used with Benjamin Electric Manufacturing Co. bowl type reflectors, the mounting height being 35 feet from ground.

Fig. 2 is an elevation and plan of the above. By using care in selection of a reflector having a photometric curve of suitable characteristics and mounting and spacing the reflector correctly, very desirable results can be produced. In the above case it is shown in Fig. 3 what results can be accomplished by predetermination of spacing and mounting of units by the application of the laws of illumination.

In Fig. 3 A and A₁ are the 750-watt reflectors

spaced 40 feet apart and mounted at distance d or 32 ft.—0 in. above the working plane. Foot candles = F.C. The photometric curve in candle power for the various angles is shown at C.P. Therefore

$$\text{F.C.} = \frac{\text{CP}}{d^2} \times \cos 3.$$

FC for A and FC for A₁ is shown at various distances between the units. The third line shows the resultant foot candles FC between the units, thus giving an



A PORTION OF THE MACHINE SHOP—Fig. 4

almost absolute uniformity of illumination on the working plane. In fact the illumination at 4 feet from the wall and at the greatest distance from lighting units shows an illumination of 2.34 foot-candles.

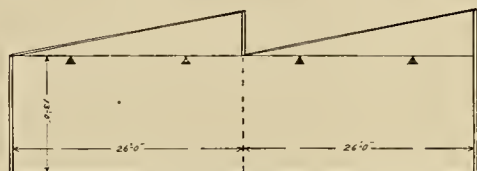
Fig. 4 is a night photograph of a portion of the machine shop.

THE HEAVY MACHINES

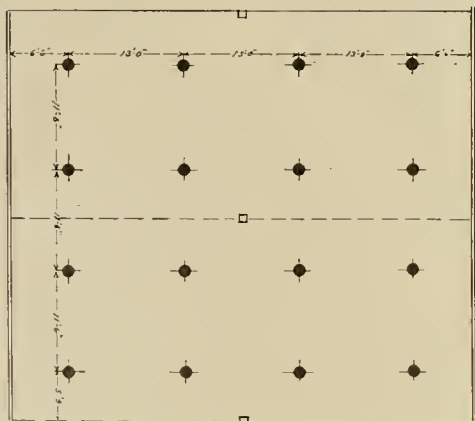
of the machine shop by night. In the foreground are 400-watt bowl type reflectors, the mounting height being 29 feet. The bays are 43 ft. by 64 ft., the units being spaced 21 ft. and 32 ft. respectively. In the background of the picture beyond the parallel light streaks which were caused by the passing of locomotives during the taking of the photograph, is the shipping department, the units being mounted the same height; but in this case one center unit in a width of 43 ft., the distance between units being 48 feet.



Fig. 5 shows the mounting height and spacing of units. The reflectors are of the deep bowl type Benjamin and are each equipped with 100 watt Type "O" Edison Mazda lamps. There were no 100-watt type of reflectors in stock giving the required photometric



ELEVATION



PLAN

MOUNTING HEIGHT AND SPACING OF UNITS—Fig. 5

This represents the plan and elevation of the lighting shown in Figure 4.

curve. 200-watt reflectors were available, the focal length of lamp was lengthened about 1 in. in this reflector, thereby giving the desired characteristic curve. The result shown in the photograph speaks for itself. It clearly shows what can be accomplished by careful selection of reflector and proper spacing and

mounting height. It also shows the advantage of the use of deep bowl reflectors even at comparatively low mounting heights in the elimination of glare.

The proper maintenance of a good lighting system after installation should be carefully considered. The deterioration of tungsten lamps and reflectors due to accumulations of dust on the lamp and reflector surfaces amount to as much as 40 per cent if not properly cleaned. In one installation it was found under test that 25% of illumination was lost in the accumulation of dust on the lamp alone. All lamps and reflectors should receive a periodic cleaning at least once every six weeks.

ELECTRIC VEHICLES EXTENSIVELY USED IN POSTAL SERVICE

Electric trucks are being used very successfully by the Postal Department in a large number of cities. St. Louis has had a fleet of electric trucks in its postal service for more than six years, which have given splendid service even under the most severe weather conditions. These trucks are in service from 5.45 a.m. to 11.30 p.m. and average 30 miles each day.

The postal service in Boston uses 15 electric trucks which are operated on the "battery-service" plan. These "electrics" make runs of 25 miles each day, and have made substantial savings as well as greater efficiency in handling the mail.

The largest electric postal fleet is probably that of the New York Postal Transfer Service, which operates 47 "electrics." These trucks have been in service for three years, and are on duty for two ten-hour periods each day.

It is interesting to note that several foreign countries have long appreciated the electric vehicle for postal service. A fleet of 30 electric trucks was installed in Vienna in 1913, and after one year's experimentation was pronounced to be particularly satisfactory for the transportation of mails.

CALCULATIONS IN USE OF PROJECTORS

BY WALDO C. COLE

(In the protection of industrial plants as well as in ornamental illumination, the question of how many projectors to use at a given distance is one of the utmost importance. A combination of theoretical calculation under ideal conditions corrected by practical factors gives very accurate results as can be judged from the problem considered below. The curves for the determination of light intensity at given distances should prove of great value in actual use. The author is an investigator of industrial problems for the San Francisco office of the Westinghouse Electric Company.—The Editor.)

It is a comparatively easy matter to predetermine the performance of a flood light projector equipped with a Mazda "C" flood light lamp under operating conditions. Fig. 1 represents the performance of a Universal Flood Light Projector equipped with a 400-watt flood light Mazda C lamp. The lamp filament center is presumed to be at the focal point and an analysis of the reflected beams has been made in the

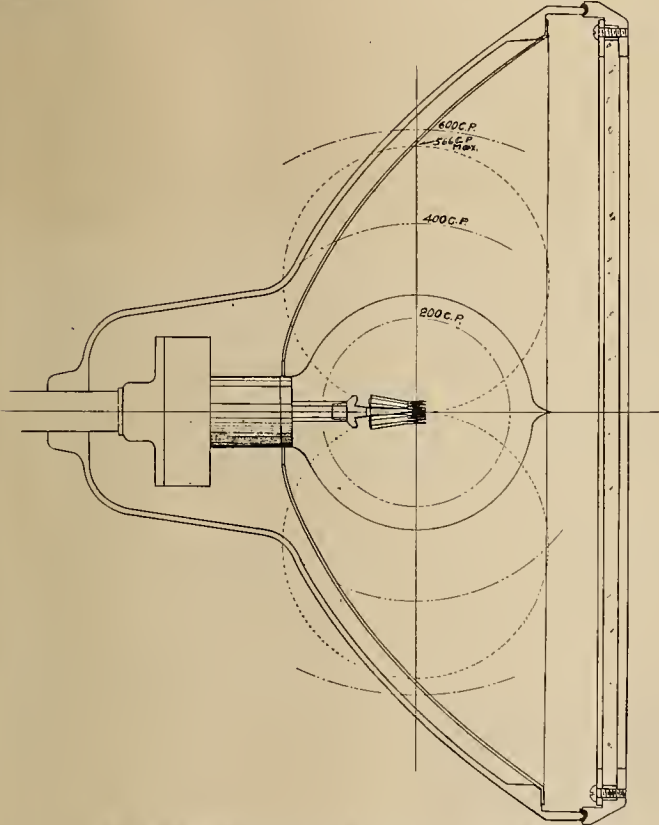


FIG. 1—THE DISTRIBUTION OF LIGHT ZONES FROM A MAZDA C LAMP
Note the regions of greatest intensity: This is the result from a light source which combines the vertical and horizontal.

same way as for the elementary light sources to determine the spread.

The minimum spread that can be expected is 10 degrees for the total. This will result in a beam of light of conical form whose diameter and area will have the values shown in Fig. 2 for distances along the beam. There is also included the same information for a beam of 20 degrees and one of 30 degrees spread. The intensity of illumination will vary as shown in Figs. 3 and 4. In using the values for intensity of illumination shown it must be remembered that corrections must be made for atmospheric conditions which will vary from nearly 100% on a foggy night along the coast to a smaller per cent on clear nights, depending on the neighborhood.

The intensity of illumination depends entirely on the results desired and the character of the surface to

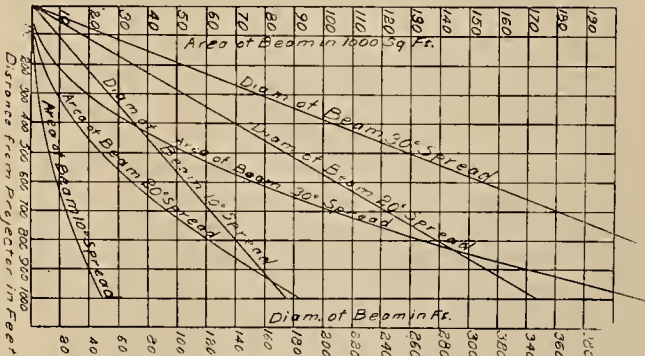


FIG. 2—DIAMETER AND AREA OF CONICAL BEAM
This represents the diameter and area of a beam of 10°, 20° or 30° spread at given distances from the source of light.

be illuminated. Space will not permit a discussion of this very vital subject.

An Actual Problem

By reference to the curves just discussed it is possible to make quick determinations for the applications of the Universal Flood Light Projector. As an example, assume we wish to illuminate a wall 300 feet away to an intensity of 0.3 foot candles. The atmospheric conditions added to the other losses outside of the projector we assume amount to 60 per cent. This

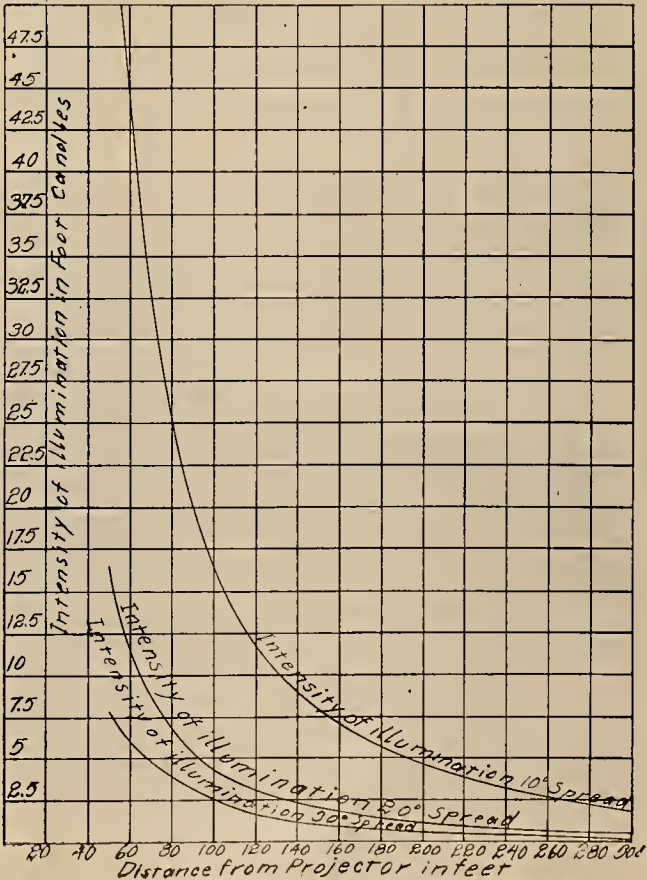


FIG. 3—INTENSITY OF ILLUMINATION UP TO 300 FEET FROM THE LIGHT SOURCE

value can only be determined by experience, which is not difficult to acquire.

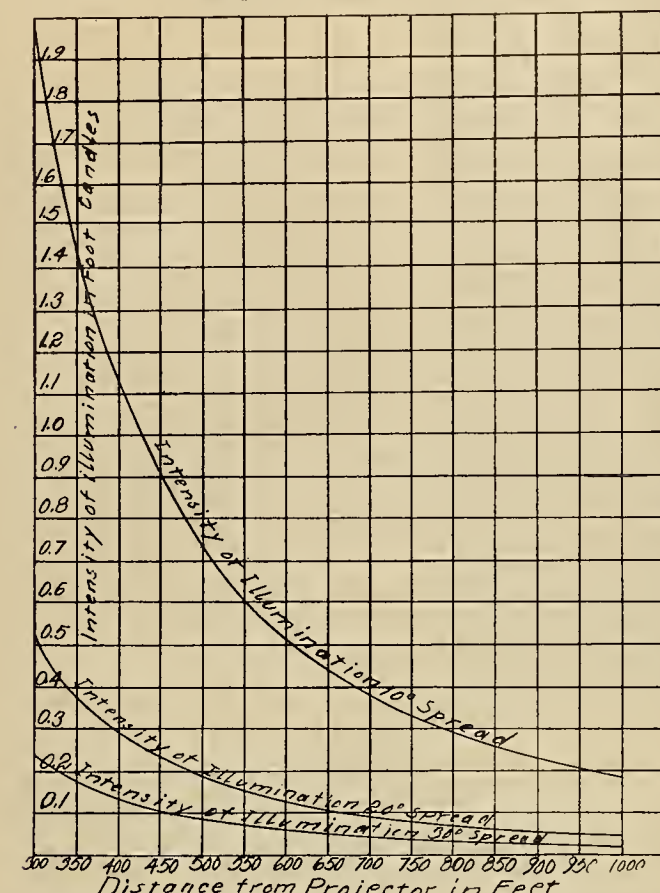


FIG. 4—INTENSITY OF ILLUMINATION FROM 300 TO 1000 FEET FROM THE LIGHT SOURCE

From Fig. 3 it is seen that at 300 feet the intensity with a 10° spread and no losses considered is 1.75 foot candles. This is more than was decided to be necessary—observations taken previous to making the calculation, the useful light falling on the wall will be 0.7 foot

candle. This is more than was decided to be necessary. If a spread of 20° is used from the curve it is seen that the average intensity at 300 feet, making no allowance for losses, will be 0.5 foot candles and 60 per cent loss will result in .02 foot candles of useful intensity on the surface of the wall. This would require 15 projectors directed to the same point to give the required intensity of illumination. From Fig. 2 it is seen that the diameter of the beam would be 105 feet. Undoubtedly this would result in an area light greater than ordinarily could be expected.

By interpolation, however, it can be seen that with a 15° spread of beam the intensity of illumination will be about 1 foot candle and after making the correction, 0.4 foot candles of useful light will reach the wall to be lighted. This is a value close enough for the work in hand, that is, for ordinary work on wharves, for patrolmen's use around factories, bridges, etc.

TRAINING THE YOUNG ELECTRICIAN

(This model trades school of Portland, Oregon, is an example of what we might have in other western cities to prepare our boys to take that position between men of the ranks and professional men for which so little training is offered under our present system.—The Editor.)

The first public trade school was opened in Portland, Oregon, in the fall of 1908 with an enrollment of 127, in some old buildings formerly used for grammar school work. Today the school shows a day and evening enrollment of over 1000 and is housed in one of the largest and best equipped buildings of its kind found anywhere in the west. The site of the new school comprises six city blocks.

In response to the growing public sentiment, that a trade school did not meet the needs of the community, the work of the school was extended in 1915.

The four-year technical course is the outcome of a demand both from in and from out the school for a course that will give a broader and more general training than is possible in the trades courses. The increased time will permit a greater amount of academic work and allow instruction to be given in several closely related trades. This has two objects in view—first, to develop greater resourcefulness and a broader and more comprehensive view of trade and manufacturing processes, and, second, to give the younger boy a chance to gain experience in several occupations before definitely choosing his life's work. Statistics in vocational guidance show that 80 per cent of the grammar school graduates have not chosen the kind of work they wish to follow, and cannot do so without some experience upon which to base a decision.



THE BENSON POLYTECHNIC HIGH SCHOOL

This modern and completely equipped plant was made possible by the generosity of Mr. Simon Benson of Portland who donated \$100,000 with the provision that the city furnish a like sum for its erection.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(The sustaining of a Kansas act providing for the support of a state water commission, the necessity of field investigation in deciding certain irrigation questions, a Washington decision on the use of a city's water for power purposes and a decision in behalf of the Reclamation Service project on the Umatilla river in Oregon are here emphasized. The statement that the use of water in power plants renders it unfit for human consumption and the Oregon decision that one year's non-use of a water right for irrigation purposes constitutes abandonment are court actions of particular interest.—The Editor.)

Wear v. State of Kansas, 38 Sup. Ct. Rep. 55

Regulation of use of Lands under Navigable Waters.—At its 1917 session, the Kansas Legislature passed an act creating a water commission, composed of the governor and two civil engineers to be appointed by him. The principal duties of the commission are to investigate the many water problems of the state, including flood prevention, drainage, domestic water supply, water power, navigation and irrigation, and to make recommendations to the next session of the legislature. A water commission fund is provided from the money "received as compensation for sand taken from any navigable stream except such amounts as drainage districts may be entitled to under the law." A charge for the taking of sand from navigable streams was provided for by an act of 1913, requiring payment of ten per cent of the market value on the river bank of sand taken by private persons or corporations from the beds of streams subject to the control of the state. The validity of the 1913 act was questioned by those compelled to pay the charge, and the United States Supreme Court in the *Wear* case has upheld the act.

Cleary v. Daniels, — Utah —, 167 Pac. 820

Sharp v. Whitmore, — Utah —, 168 Pac. 273

Measure of a Right by Appropriation.—In the *Cleary* case, the Utah Supreme Court emphasizes the principle of prior appropriation that the appropriator only acquires the right to the use of a specific quantity of water for that period during any year when he has actual use for it, and that a subsequent appropriator is entitled to the use of the waters of the stream at other periods.

In its opinion the Supreme Court uses the words: "Water in this arid region is too precious to be wasted."

In the *Sharp* case, however, the Utah Supreme Court allowed a continuous flow of 5 cubic feet per second for the irrigation of 125 acres of land. The successful claimant introduced the evidence of a number of farmers, who said that that amount of water had been used upon the land and was necessary to properly irrigate it. As against such evidence was the testimony of a former state engineer of Utah that only an intermittent flow of 5 cubic feet per second was necessary. The low duty of water established in this case illustrates the necessity of trying such action, at least in the first instance, before a tribunal which can make a complete field investigation on its own initiative, and not rest for the controlling evidence in the case upon ordinary witnesses.

City of Raymond v. Willapa Power Co., — Wash. —, 167 Pac. 914

Pleasant Valley Irr. & P. Co. v. Barker, — Wash. —, 167 Pac. 1092

Interpretation of Grant of Water Rights—Judicial Notice: The City of Raymond, in purchasing land for the construction of its water supply system, also purchased from the Raymond Water Company "the exclusive right and privilege to take and appropriate to its own use for any and all purposes any and all of the water flowing, or which may hereafter flow, into the south fork of the Willapa River, or any of the tributaries of said river, over, across, or through the following described real estate * * *"—the real estate described being situated upon the stream above the point of diversion of the city.

The Willapa Power Company later purchased the described land from the Raymond Water Company and commenced the construction of a dam across the south fork of Willapa River, with the intention of installing a power plant for the use of the waters of the river and their return above the intake of the city's system. The Supreme Court of Washington held that the city was entitled to an injunction against the power company, as all rights to be exercised by the power company, so far as the use of water is concerned, were conveyed by the previous owner to the city.

It is interesting to note that in referring to possible pollution, the Supreme Court said: "The court knows judicially that modern science has demonstrated that the use of water in power plants and for other purposes where human beings must of necessity be in attendance about it seriously endangers its purity, rendering it unfit for human consumption."

The *Pleasant Valley* case likewise deals with the purchase of a water right. The defendants originally owned the riparian rights and appropriation rights in question, but conveyed them to the plaintiff company. It was held in this case that by such conveyance the defendants were left without any right to the use of the waters of the creek.

Washington has a statute similar to that in most of the western states, providing that an appropriator may use natural channels for the conveyance of waters, appropriated from other streams or stored, to the point of use. The defendants having objected to the conveyance of waters, stored by the plaintiff, through their lands, the Court held that "the streams of the state are highways for the flow of water therein to the extent that nature has made them such"—it being shown in the case that the conveyance of such

waters did not raise the waters in the creek above ordinary high water mark.

In re Waters of Umatilla River, 168 Pac. 922

Appropriations of Water by the United States—Abandonment of Water Rights in Oregon: This case is one which was originally initiated before the state engineer, under the provisions of the Oregon Water Code of 1909, by the United States in behalf of its Reclamation Service project on the Umatilla River.

In 1905 an act was passed in Oregon providing that, when the duly authorized officer of the United States shall give notice to the state engineer that the United States intends to utilize certain specified waters, the waters specified in such notice and unappropriated at the date of filing shall not be subject to further appropriation under the laws of the state. A similar act was adopted in behalf of projects under the reclamation act in a number of the other western states. The Umatilla case is the first in which this statute was before the court, and its validity remains unquestioned.

In this case the Supreme Court interpreted an Oregon act of 1891 to provide that one year's non-use of a water right for irrigation purposes shall constitute an abandonment. This is a decided departure, as the Supreme Court in former cases had held that a non-use would have to continue for ten years to constitute an abandonment.

Allen v. Railroad Commission of California and Lake Hemet Water Company,
Decided Dec. 31, 1917

Irrigation Water-Right Contracts—Jurisdiction of Railroad Commission: A form of commercial irrigation enterprise which was in use in the early development of irrigation in California and elsewhere in the west, was the company selling water-right contracts for a stipulated sum per acre or per unit of quantity, which contracts provided for a fixed additional annual charge. The stockholders in such companies generally owned land which had been sub-divided and was being sold with the water rights appurtenant thereto. Ordinarily two companies were formed, the land company and the water company. The real reason for the organization of the water company was to furnish water so that the land might be sold, as without irrigation there was no market for such land.

Many of such enterprises were organized during the later eighties, and among them was one organized to promote the sub-division and sale of part of a Mexican rancho along the San Jacinto River, in what is now Riverside County. The Hemet Land Company was formed to take care of the land sales, and the Lake Hemet Water Company was formed to provide water for irrigation. Water-right certificates were sold by the Lake Hemet Water Company, which became appurtenant to specified tracts of land sold by the Hemet Land Company. The water-right certificates were issued on the basis of one miner's inch of water for 8 acres of land, and the certificates were sold for prices varying from \$50.00 to \$250.00 per acre—the larger number of certificates being sold at the rate of \$75.00 per acre. The total amount received from the sale of such water-right certificates was \$438,938.60. The water-right certificates provided for an additional

annual rate of \$5.00 per acre in a few instances, but in most cases provided for an annual rate of \$2.00 per acre.

About 94% of the "net safe yield" of water available to the use of the company is covered by water-right certificates. About 3% of the net safe yield is sold to consumers within the city of Hemet. The remaining 3% is held in storage.

In 1916 the Lake Hemet Water Company petitioned the Railroad Commission to make an order raising its rates for both the irrigation and domestic water supply. About three hundred owners of water-right certificates appeared before the Commission and argued that the Company was not a public utility, and that the Commission had no authority to set aside existing contracts. After a number of public hearings the Railroad Commission, on October 21st, 1916, handed down its decision holding that the Water Company is a public utility, and ordering a new schedule of rates somewhat in excess of the former rates. The holders of water-right certificates took the matter to the Supreme Court, and on December 31st, 1917, the Court handed down its opinion holding that the Company, so far as the water-right certificate holders are concerned, is not a public utility, and that the action of the Commission in setting aside the water-right contracts is void.

The decision is of importance as the Railroad Commission has uniformly held that all such companies are public utilities. On November 8th, 1912, the Supreme Court of California, in *Thayer v. California Development Company*, 164 Cal. 117, held that the Company is not a public utility, as it had not sold water to any users except those under contract with it. At the following session of the California Legislature, an act was passed declaring all water companies public utilities except those organized for the sole purpose of delivering water to their stock-holders at cost. This statute and the later 1915 statute of the same import, are commented upon in the Allen case, but it is held that their provisions do not apply to companies previously organized.

The case illustrates the point that a company may be a public utility for part of its service, and not a public utility for the remainder of the service. So far as furnishing water for domestic supply within the town of Hemet is concerned, the Lake Hemet Water Company is held to be a public utility, but so far as the service of the greater part of the water available is concerned, it is not a public utility.

THE HUMAN BODY AS AN ELECTRICAL CONDUCTOR

It has been learned through experiments that we may consider the human body as a system of electrical conductors having different resistances. The body is not a unit like a metallic conductor, but it is a transmission system, whose individual conductors each belong to a different class, depending on their resistance. The order of resistances offered by the tissues to the electric current is about as follows: bones, fat, skin, muscles, nerves, blood and other liquids of the body.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(You may own a strip of land which is asked for by a railroad or a public utility—or you may represent a public utility which is seeking to acquire land for a reservoir site or for right-of-way purposes. On what basis will the price be fixed? The question of how much is to be allowed for possible future uses of the land and how much for damage to adjacent property in the use for which it is designed is here considered from the valuation engineer's as well as from the court's standpoint. The author has recently given expert testimony in several public utility valuation cases.—The Editor.)

DETERMINATION OF THE VALUE OF REAL ESTATE IN EMINENT DOMAIN PROCEEDINGS AND FOR RATE-FIXING PURPOSES

While the writer can not accept as final the apparent requirement of the courts that value of the property used and useful is the proper basis of the calculation when the earnings of a public utility are to be fixed by regulation, he can not but admit that until there is a reversal of the attitude of the courts this requirement must be complied with and that, therefore, when the value of land is under consideration in a rate case the same principles of valuation must control as in the case of a sale or of condemnation proceedings.

The fact seems to be well established that when land is required for some purpose for which it may be taken under eminent domain proceedings, the inquiry must be directed to market value with due regard to every use for which the land is suitable. The question is not what the purchaser can afford to pay in view of the special purpose for which he wants the land but what in view of the land's adaptability for this together with all other possible uses it would bring in the market under the assumption of competition for its acquisition. The market value will ordinarily be determined by the highest use to which the land can be put, and in view of this fact a consideration of this highest use may make consideration of inferior uses unnecessary except to show that they stand low in the scale and that their exclusion from consideration will not affect market value.

Sometimes of course the adaptability of a tract of land for a high use is recognized but the demand of society that it be put to that use lies in the future. While the land is, perhaps, peculiarly adapted for some special purpose, for example to serve as a light house site or under improved transportation conditions as a quarry or as a reservoir site, the demand for such use may not be made immediately. Nevertheless the probability or the certainty that the land will be required for some specific purpose at some time in the future, and that when the necessity for such use actually arises, its value will be greater than for any other uses to which it can be put, may be an element of potential value. In such circumstances a market value higher than that determined for other similar land not having the adaptability for the special use will be the more difficult to recognize the farther in the future and the more uncertain the time at which the necessity will arise for putting the land to the special use.

On the subject of the market value of land the U. S. Supreme Court in *Boom Co. vs. Patterson* (98 U. S. 403, 408; 25 L. Ed., 206) says:

"The inquiry in such cases must be what is the property worth in the market, viewed not merely with reference to the uses to which it is at the time applied, but with reference to the uses to which it is plainly adapted; that is to say, what is it worth from its availability for valuable uses. . . . Its capability of being thus available gives it a market value which can be readily estimated."

In this case the Boom Company had brought suit in Minnesota against Patterson, a citizen of Illinois, to condemn three islands which were desired for use in connection with a series of log booms. A verdict was rendered by the jury for \$9358.33, the value of the islands having been found to be \$300, aside from any consideration of value for boom purposes and \$9058.33 due to their adaptability for this special use. The Court granted a motion for a new trial unless the owner would consent to accept \$5500. This amount was acceptable to the owner and judgment for this amount was entered in his favor. The Boom Company then appealed.

The Supreme Court is perhaps a little overconfident if it would have the inference drawn from the quoted statement that market value of land can always be readily estimated. In other respects the statement is clear and logical. The real question is, What is the value of the property under consideration of all uses to which it may be applied? The controlling factor in a reply to this question will generally be the value determined from the highest uses. Sometimes, of course, value resulting from various uses may be more or less cumulative. Thus, for example, a watershed may also have value as a forest and an artesian well tract while used as a source of water may, at the same time, retain its value as farming land.

Value in the sense here used is market value and must not be mistaken for value to a person who desires to acquire the property when taken in the sense of what such person can afford to pay for it. On this subject in *U. S. vs. Chandler-Dunbar Water Power Company* (229 U. S. 80) the U. S. Supreme Court says:

"In condemnation proceedings the value of the property to the Government for its particular use is not a criterion. The owner must be compensated for what is taken from him, but that is done when he is paid its fair market value for all available uses and purposes."

Referring to special value of land for canal and lock purposes in this same case the Court says:

"The exception taken to the inclusion as an element of value of the availability of these parcels of land for lock and canal purposes must be overruled. That this land had a prospective value for the purpose of constructing a canal and lock parallel with those in use had passed beyond the region of the purely conjectural or speculative. That one or more additional parallel canals and locks would be needed to meet

the increasing demands of lake traffic was an immediate probability. This land was the only land available for the purpose."

In the case of *San Diego Land and Town Co. vs. George Neale et al* (78 Cal. 63, 68; 30 Pac. Rep. 372; 3 L.R.A. 372) the majority of the State Supreme Court says in dealing with market value of land:

"The consensus of the best considered cases is that for the purposes in hand the value to be taken is the market value, by which is undoubtedly meant, not what the owner would realize at a forced sale, but 'the price that he could obtain after reasonable and ample time, such as would ordinarily be taken by an owner to make sale of like property.' . . . But in many instances, as in the case before us, there is no actual demand or current rate of price, either because there have been no sales of similar property, or because the particular piece is the only thing of its kind in the neighborhood, and no one has been able to use it for the purpose for which it is suitable and for which it may be highly profitable to use it. . . . From the necessity of the case the value must be arrived at from the opinions of well informed persons, based upon the purposes for which the property is suitable. . . . What is done is merely to take into consideration the purposes for which the property is suitable, as a means of ascertaining what reasonable purchasers would in all probability be willing to give for it, which, in a general sense, may be said to be the market value. And in such an inquiry it is manifest that the fact that the property in question has not previously been used for the purposes in question is irrelevant. The current of authority sustains these views."

There is but little to add to a statement so clear as this. If the land is not already in use for the purpose for which it is being valued but the time can be forecast when its use for this purpose will be necessary, the appraisal should be made with this fact in mind.

Concerning the admissibility of evidence in court proceedings relating to value of land for some special use there has been much uncertainty which seems to have been cleared away by the Supreme Court of California in the comparatively recent case of "*Sacramento Southern Railroad Co. vs. Heilbron*" (156 Cal. 408) which involves the condemnation of a strip of land for railroad purposes. It was contended in this case that the rule as laid down in California permits evidence of the value of land in terms of money when the land is used for a particular purpose. The Court says:

"It is seen, therefore, that this court by its latest utterances has definitely aligned itself with the great majority of the courts in holding that damages must be measured by the market value of the land at the time it is taken, that the test is not the value for a special purpose, but the fair market value of the land in view of all the purposes to which it is naturally adapted; that, therefore, while evidence that it is 'valuable' for this or that or another purpose may always be given and should be freely received, the value in terms of money, the price, which one or another, witness may think the land would bring for this or that or the other specific purpose is not admissible as an element in determining market value."

The Court here apparently intends to exclude any evidence relating to what a purchaser could afford to pay for the land for any specific purposes. The rule thus laid down should not, however, debar from consideration the economic features of an enterprise in connection with which the land can be put to profitable

use; but the question to be answered will not be as already stated how much could the owners or promoters of such an enterprise afford to pay for the land but rather what effect will such circumstances, under the assumption of competition, have upon the market value of the land. The courts must and do exclude evidence bearing on value which is too remote or speculative in character. But the courts will be interested in the same facts which would influence a prudent purchaser who before making an offer weighs all the facts which are likely in any way to affect the market value. Special adaptability to a special use will not be overlooked, due allowance will be made for risk, for cost of preparation, and for the time which must elapse before a return can be realized and all such facts will be weighed to determine what in the light thereof a well informed public would consider the property worth.

In the case of land which is required for railroad and canal rights of way, the problem is complicated by the fact that sales of property for such purposes are generally so rare in the locality where a valuation is to be made that the effect of use for this special purpose upon market value is not readily traceable. The owner of property that is wanted for such a purpose may benefit by the proposed improvement which is going to promote general prosperity and may make the remainder of his holdings available for uses which are out of the question before the improvement is made. But in this respect the owner is no better or worse off than his neighbors and the fact that he participates in the general benefit is no reason why he should not get full market value for what is taken from him. He may suffer injury far beyond that resulting directly from the taking of a few acres. If he were allowed the value acre for acre of adjacent property or value for other uses than rights of way he would be inadequately compensated. He would not have recovered full market value. The difficulty of approximating the sacrifice which a land owner makes when he gives up a right-of-way has led to the attempt to estimate this in relation to the value of the land for ordinary uses. This relation is expressed by the so-called 'value multiple.' It has, thus, become a practice to value rights-of-way for railroads at from 1.5 to 3.0 times the market value of lands of similar character. Custom has given land required for such a use such values. Because there are no frequent transfers of land for right-of-way use, the value multiple which is found to be generally accepted in a region where a right-of-way is to be valued may be the best guide in fixing this value.

The value multiple, as applied in any locality to railroad rights-of-way, and the unit price per pole of a power line are the outcome of numerous adjustments resulting from considerations as here indicated and where such multiples are recognized, they will have an effect upon the market value of other similar easements.

On this subject Justice Hughes in the *Minnesota Rate Cases* (230 U.S. 352; 33 Sup. Ct. 729), speaking for the U. S. Supreme Court says:

"The increase sought for 'railway value' in these cases is an increment over all outlays of the carrier and over the values of similar land in the vicinity. It is an increment

which can not be referred to any known criterion, but must rest on a mere expression of judgment which finds no proper test or standard in the transactions of the business world. It is an increment which in the last analysis must rest on an estimate of the value of the railroad use as compared with other business uses, it involves an appreciation of the return from rates. (When rates themselves are in dispute) and a sweeping generalization embracing substantially all the activities of the community. For an allowance of this character there is no warrant.

"Assuming that the company is entitled to a reasonable share in the general prosperity of the communities which it serves, and thus to attribute to its property an increase in value, still the increase so allowed, apart from any improvements it may make, cannot properly extend beyond the fair average of the normal market value of land in the vicinity having a similar character. Otherwise we enter into the realm of mere conjecture. We, therefore, hold that it was error to base the estimates of the value of the right-of-way, yards and terminals upon the so-called 'railway value' of the property. The company would certainly have no ground of complaint if it were allowed a value for these lands equal to the fair average market value of similar land in the vicinity, without additions by the use of multipliers, or otherwise, to cover hypothetical outlays."

It seems to be here assumed that the 'railway value' results from railway use and from the earnings that are made possible by such use and the Court is unquestionably right in stating that an appreciation due to this cause is not allowable when rates themselves are in dispute. Nevertheless the fact remains that the general use of value multiples in any locality is a factor which may have to be taken into account when a right-of-way appraisal is to be made. This fact was recognized by Special Master Thorington in the earlier case of the Georgia Railway Company vs. Railroad Commission of Alabama (Jan. 8, 1912) in which, after stating that the fact that a railroad company is compelled to pay in addition to market value as would be determined from ordinary uses, a further sum due to damages or because it is a railroad company, adds nothing whatever to acreage value, he says:

"It is, however, proper to add that right-of-way values including estimates for damages to property not taken, or excess cost that railroads are compelled to pay in order to acquire right-of-way property needed by them for railroad use, have been recognized by some courts, and some railroad commissions, and such excess cost was held to properly constitute part of the right-of-way valuation for rate purposes. In *Shephard vs. Northern Pacific Railway Co. et al* (184 Fed. 765) it is said the evidence was conclusive 'that every railroad company is compelled to pay more than the normal market value of property in sales between private parties for the irregular tracts it needs and acquires for rights-of-way, yards and station grounds. . . . The measure of the value of real estate is its market value for its most available use.'"

And now a word about the factors which must be considered when an appraisal is to be made of the value of real estate for ordinary and not special use. Ordinarily there is no analysis made of these factors. The judgment of the public as the same has found expression in other sales or offerings of similar property is accepted as a sufficiently dependable index. The broad rule that the return in rents or net income is the basis of value may find application; but when it is applied, some regard must be had to the future not alone in the matter of the actual return that it is

reasonable to assume but also in the matter of the effect of the possible rents obtainable upon the unearned increment or the added value that will result from the higher uses to which the real estate will be put as population density increases. (See the earlier article on this subject on the Value of Reservoir Lands in San Francisco Bay region.)

Going back of the judgment of the public which fixes the market value it is evident that when any two tracts of land are compared there will be points of difference as well as points of resemblance. Thus, for example, if two tracts of agricultural land are under consideration the tract which is nearest to a market (in the matter of cost of transportation) will have an advantage over the other. Good roads which make access to the market and to the advantages of a population center easy, lend value to the properties, school facilities also add value, at least equal under ordinary conditions to what the acquisition of the school property has cost the owner of the land; so too irrigation systems, drainage works, and the like, as well as the more obvious factors relating to character of soil and subsoil, the return from crops that can be profitably cultivated, climate and environment. The menace from hurricanes, floods and other fortuitous events, too, affects the desirability of ownership and therefore value. That it will be difficult to evaluate in any definite way these factors and others that will readily occur to an appraiser goes without saying. Nevertheless they deserve attention and the hope may be expressed that with reference to many of them their relative importance at least in establishing market value may yet be found.

U. S. PUBLIC SERVICE RESERVE

The United States Government is forming a reservoir of men who are willing, when the need arises, to work for the government or on government contracts to help win the war.

A recent rough survey of requirements shows that a vast number of men will soon have to leave their peace time vocations and enter war industry. Just when any individual may be needed cannot be said in advance. Many will serve best where they are. But an imperative need has developed for a large reservoir of citizens who are ready to respond to our country's calls as they come.

The U. S. Public Service Reserve is the official organization created under the Department of Labor to fill this need. It has already enrolled on its lists and has available classified and thoroughly indexed records of thousands of engineers and other professional men, skilled and ordinary laborers and men of all degrees of capacity and attainment. It is furnishing constantly to the Army, Navy and other branches of the Government, names and records of qualified men who have expressed their willingness to serve.

In operation, the Reserve furnishes names and records to the Government when it calls for them. It does not undertake to act as an active agent in hunting a place for any member. To increase its usefulness it needs a large increase in membership.

WOMEN IN THE INDUSTRY

WELFARE WORK IN A JAPANESE FACTORY

The Kanegofuchi Spinning Company, Ltd., a Japanese cotton milling concern which has thousands of employees, has established a most extensive system of welfare work, patterned closely after European and American methods with features that are peculiarly Japanese.

The young female employees coming from the country are housed in dormitories on the factory grounds, and are in charge of officials who are assisted by matrons. There is a comfortable general sitting room, also special visiting rooms where the girls may receive their relatives, who are encouraged to make visits at intervals and are accommodated at the dormitories free during their stay. The company also influences the girls to keep in correspondence with their homes. Plenty of writing material is furnished, and the postage on all letters is provided.

Bath rooms are open morning and evening, and there is also a special common dressing room where the girls change their off-time dress for the clothing they are required to wear in the mills, the company having its own laundry employees to take charge of the garments, which are laundered free, the purpose of the system being that it insures cleanliness and counts for the health of the operatives. There is a special rest-room in the dormitories for the slightly indisposed who require a few days' rest.

The company has large dining halls where food cooked by experts is sold at considerably below what the cost of the raw materials would be to the individuals. The company expressly states that this costs several thousand yen a month more than is collected, but the increased working efficiency of the operatives resulting from the provision of plenty of good food is obvious and more than pays the cost.

At a cost of some \$65,000, the company has constructed recreation halls on the premises of each mill. These halls have stages with the equipment of regular theatres and in addition there is an open stage at the

end of each building for open-air attractions. On every "shift day" (four times a month) and on public holidays, theatricals, moving pictures, lectures, etc., are given.

A completely equipped factory hospital is provided which is described as a model of compact efficiency. There is a consulting room, an operating room, dispensary, wards, etc., with up-to-date equipment and experienced physicians and nurses in attendance. A contagious-disease hospital and a bacteriological laboratory have lately been erected in addition to the others. The company is planning three

sanitariums at seaside resorts, one being under construction at Takasago. These will be for the benefit of employees for whom the company physicians prescribe a complete rest.

WOMAN PROPOSED FOR PUBLIC SERVICE COMMISSION

Ex-Senator William M. Bennett, Republican nominee for Mayor of New York in the last election, has sent a letter to Governor Whitman protesting against the appointment of

F. J. H. Kracke as a Public Service Commissioner. Mr. Bennett suggested the appointment of a woman for the position. "I would suggest that the time has come," said Mr. Bennett, "for the appointment of a woman to this position. Women now have the vote, and new duties and interests have now been given to them. A woman member of the Public Service Commission would bring to it new views and new life and tend to restore it to the original idea that it was appointed as a defender of the public and to protect the public against the rapacity and indifference of public utility corporations."

EMPLOY WOMEN IN DRAFTING ROOM

The engineering department force of H. M. Byllesby & Company, of Chicago, has been depleted considerably by the entrance of draftsmen into government service. To meet the situation a new policy has been inaugurated of employing women in the drafting room. A start in this direction was made with

DID IT EVER OCCUR TO YOU THAT:

Every large corporation needs a library of its own. You perhaps have a miscellaneous collection of books and pamphlets on hand which are invaluable records on the subject for which you are a specialist, but unless these are catalogued and kept up to date they are of little value to you. Many of the public utility companies of the East are employing women as business librarians, not only to keep the books in order, but to look up subjects and find records as requested, bring new material to the attention of the man who should see it and in general to make over the library into a living organ rather than a scrap heap.

ELECTRICAL TERMS ILLUSTRATED—III

IF YOU HAVE WOMEN IN YOUR EMPLOY-



ENCOURAGE THEM TO BE

"METERS"

THE RED CROSS UNITS and other groups of "meters" for patriotic and for social purposes which have been encouraged by many of the electric companies among their office or factory forces have filled a distinct need. Not only is it good for a woman to feel that

she has an opportunity for patriotic service in her work, but it is good for her to meet together with her fellow workers in a social way and learn to consider herself one of a loyal unit, working in a common interest.

the hiring of a woman as tracer, and it will be the policy to continue to employ women to take the place of the men who join the government service as rapidly as possible.

WOMEN ELECTRICIANS FOR BRITISH ARMY

The Tommywaacs is the name colloquially given to the Women's Army Auxiliary Corps. That they are not enlisting to be employed as lady clerks merely is testified to by the following paragraph which appeared in the London Electrical Review:

The Women's Army Auxiliary Corps is calling for large numbers of women to work in aircraft repairing depots, both at home and in France. There are wanted immediately by the Royal Flying Corps 144 fitters (general machine and turners), 52 instrument repairers, 20 acetylene welders, 37 electricians, 12 draughtswomen, 2 tracers, 145 storekeepers for technical stores (knowledge of engine parts and tools), also tinsmiths and coppersmiths.

PRESENT STATUS OF WOMEN'S WORK IN AMERICA

The co-operation of organized labor and the necessity of national labor exchanges are pointed out by 'The Corn Exchange' as the two most important considerations in the employment of women as a war measure.

Already in this country there have been local investigations to determine the possibility of female labor and some interesting data has been secured. It has been found that:

1. The displacement of male labor thus far has not been large but there has been considerable shifting of positions.
2. There are indications that there will be a rapidly increasing tendency to employ women.
3. Women are successfully entering a surprisingly great variety of new occupations in office and factory.
4. There is a general tendency to treat female and male labor as entirely distinct in the matter of wages, but it is difficult to name any percentages of wages that a woman should receive less than a man, as in some cases it should be equal amounts, and in other cases somewhat less due to permanency of employment and the relative value of each as an asset.

5. The problems arising from the substitution of female labor are many and varied. They are summarized as follows:

Observing the laws which regulate hours, time and conditions of labor.

Greater liability for accident. (Notwithstanding which it has been found by experience abroad that women in the main are more careful than men and the proportion of accidents among women has been less.)

Necessity for further specialization of labor, particularly machine labor.

Necessity for special machinery adapted for operation by females.

Necessity for substituting mechanical appliances to minimize physical exertion.

And not the least problem to be solved is the psychological one.

The problem of working conditions is a very important one and for the purpose of arriving at a prac-

tical solution of this particular problem the recommendations of the Detroit Executive Club are so valuable and comprehensive that we reprint them in full, as follows:

A—Separate entrances to be provided for women, if practicable; if not, then women be allowed to report for work fifteen minutes later than men and leave fifteen minutes earlier.



DISPLAYING THEIR WARES

A group of women representatives from electric and other concerns devoted a recent meeting to mutually displaying their wares. Two Service Secretaries from electric companies, a dealer in electric fixtures and a metal worker who specializes in electric ware are represented in this group.

B—That separate workshops be provided, if possible; if not, that there be both a man and a woman supervisor stationed in the mixed departments.

C—That rest rooms and toilets adjoining workshops be provided with a matron in charge.

D—That a sufficient number of drinking fountains be installed in each department.

E—That the period of lunch be at least forty-five minutes.

F—That, if possible, a restaurant be operated on the premises; if not, at least a counter maintained where a box-lunch with hot coffee and tea and milk can be purchased at cost.

G—That provisions be made for rest periods during working hours, their frequency and duration depending upon the nature of the work.

H—That seats be provided wherever possible to avoid injury to women by standing all day at their work.

I—That sickness insurance be provided to care for workers absent because of sickness.

J—That workers on monotonous and tedious operations, to avoid undue fatigue, be transferred from time to time as seems advisable.

K—That there shall be provision for first aid attention to all workers.

L—That there be first class supervision of working conditions, with particular reference to safety, sanitation, ventilation and lighting.

M—That some person be delegated to act as Welfare Supervisor for the plant, to whom women shall have access and whose duty it shall be to have a general oversight over welfare conditions. This position might be given to some woman already in the employ of the company in addition to her other duties, but, if possible, a trained person should be secured for this work.

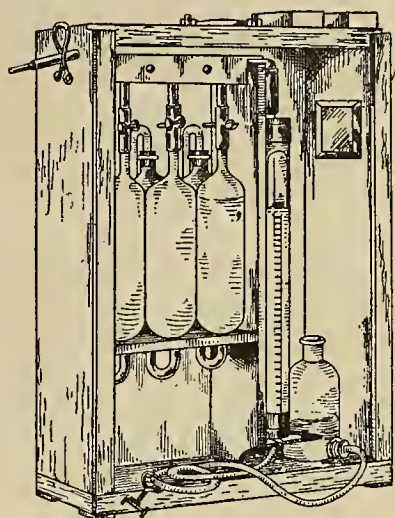
FUEL OIL AND STEAM ENGINEERING

(The chimney gas analysis is determined by volume from experiment. Many questions arise, however, in which the analysis by weight is desirable. The discussion in this article enables the engineer to compute the analysis by weight when the analysis by volume is known. Also, how to compute the air theoretically required to burn a given quantity of fuel is set forth. This information is very desirable in a discussion of fuel oil economy.—The Editor.)

ANALYSIS BY WEIGHT, AND AIR THEORETICALLY REQUIRED IN FUEL OIL FURNACE

BY ROBERT SIBLEY AND CHAS. H. DELANY

In the last discussion it was found that Orsat analyses of chimney gases are always made volumetrically. In computing combustion data from these analyses, however, it is often necessary to have the proportions or percentages by weight instead of by



THE ORSAT APPARATUS

The Orsat apparatus is a portable instrument contained in a wooden case with removable sliding door front and back, as shown in its simplest form in this illustration, taken from the report of the Power Test Committee of the American Society of Mechanical Engineers. It consists essentially of a measuring tube or burette, three absorbing bottles or pipettes, and a leveling bottle, together with the connecting tubes and apparatus. The bottle and measuring tube contain pure water; the first pipette, sodium or potassium hydrate dissolved in three times its weight of water; the second, pyrogallol acid dissolved in a like sodium hydrate solution in the proportion of 5 grams of the acid to 100 cc. of the hydrate; and the third, cuprous chloride. These chemicals are sold by most of the large dealers. Details of how this apparatus is used to determine the chimney gas analysis were set forth in a previous discussion.

volume. The volumes of carbon dioxide, oxygen, carbon monoxide, and nitrogen which constitute the chimney gas analysis of a sample volume by means of the Orsat apparatus will be represented by V_1 , V_2 , V_3 , V_4 , respectively in this discussion. Let us now see how we may transfer this relationship so that proportions by weight of M_1 , M_2 , M_3 and M_4 pounds may respectively set forth the constituents of a flue gas sample of weight M pounds. Since we are only in search of proportions by weight—that is a ratio of M_1 to M , M_2 to M etc., it is evidently not necessary to actually know the quantitative values of the weights involved.

Fundamental Laws Involved.—In a previous discussion we found by equation that all perfect gases follow the composite law—namely, that at any particular state the product of its pressure p and volume V is equal to the product of its weight M and absolute

temperature T multiplied by a constant R , or mathematically expressed

$$pV = MRT$$

Hence, we may at once write the respective mathematical relationships for the carbon dioxide, oxygen, carbon monoxide, and nitrogen of the flue gas.

It is to be remembered that in the case under consideration the pressure p and the temperature T have the same value for each component in the flue gas; consequently, we shall not put any individual subscript for the pressure p and temperature T , so that we may write these individual expressions as follows:

$$pV_1 = M_1RT \quad \text{or} \quad M_1 = \frac{pV_1}{RT}$$

$$pV_2 = M_2RT \quad \text{or} \quad M_2 = \frac{pV_2}{RT}$$

$$pV_3 = M_3RT \quad \text{or} \quad M_3 = \frac{pV_3}{RT}$$

$$pV_4 = M_4RT \quad \text{or} \quad M_4 = \frac{pV_4}{RT}$$

and for the gas as a whole, we have

$$pV = MRT \quad \text{or} \quad M = \frac{pV}{RT}$$

In our previous discussion on the elementary laws of gases, it was also found mathematically that the constant R for any perfect gas is obtained by dividing 1544 by the molecular weight of the gas in question.

From any book on elementary chemistry we find the molecular weight m , of carbon dioxide (CO_2) is 44, that of oxygen (O_2) is 32, that of carbon monoxide (CO) is 28, and that of nitrogen (N_2) is 28.

Relationship of a Component Weight to the Whole.—Bearing this in mind, it is seen from the

1544

above mathematical relationships that, since $R = \frac{1544}{m}$,

we have

$$M_1 = \frac{pV_1}{RT} = \frac{m_1 pV_1}{1544 T} = K m_1 V_1 \quad \text{if} \quad K = \frac{p}{1544 T}$$

$$M_2 = \frac{pV_2}{R_2T} = \frac{m_2pV_2}{1544T} = K m_2V_2$$

$$M_3 = \frac{pV_3}{R_3T} = \frac{m_3pV_3}{1544T} = K m_3V_3$$

$$M_4 = \frac{pV_4}{R_4T} = \frac{m_4pV_4}{1544T} = K m_4V_4$$

$$M = \frac{pV}{RT} = \frac{mpV}{1544T} = KmV$$

$$\text{But } M_1 + M_2 + M_3 + M_4 = M$$

$$\therefore M = Km_1V_1 + Km_2V_2 + Km_3V_3 + Km_4V_4 = K(m_1V_1 + m_2V_2 + m_3V_3 + m_4V_4)$$

$$\text{Let } C_s = m_1V_1 + m_2V_2 + m_3V_3 + m_4V_4$$

$$\therefore M = KC_s$$

$$\text{Also } M_1 = Km_1V_1$$

$$\text{Hence } \frac{M_1}{M} = \frac{Km_1V_1}{KC_s} = \frac{m_1V_1}{C_s} \dots\dots\dots (1)$$

A Concrete Rule for Conversions.—This last equation now gives us a simple and ready rule for determining proportions by weight if the proportions by volume are given. In other words, this rule may be stated as follows:

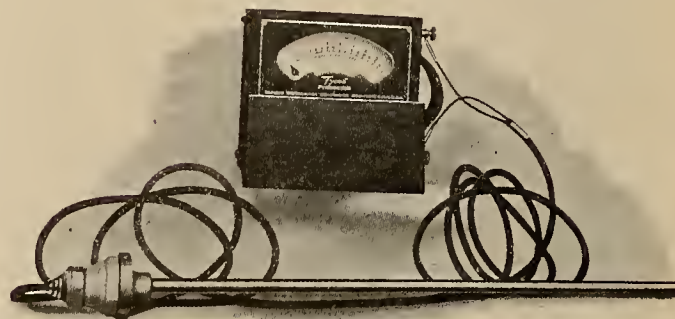
In any analysis by volume, the analysis by weight is found by first summing the products formed by multiplying each component volume by its particular molecular weight. If now this summation C_s is divided into the product of a component volume and its particular molecular weight, the proportion by weight of that component is at once ascertained.

An Illustrative Example.—Thus, a flue gas analysis shows the following proportions by volume: carbon dioxide (CO_2) .086; oxygen (O_2) .110; carbon monoxide .011; and nitrogen (N_2) .793%. Let us determine the proportions by weight present in this particular flue gas.

Since the molecular weights of carbon dioxide, oxygen, carbon monoxide and nitrogen are respectively 44, 32, 28, and 28, we find that m_1V_1 is 3.782, m_2V_2 is 3.520, m_3V_3 is .308, and m_4V_4 is 22.200. The sum of these products C_s is found to be 29.810. Hence since m_1V_1 is 3.782, we now find that the carbon dioxide component obtained by dividing 3.782 by 29.810 is .127. Similarly for the oxygen component the proportion by weight is .1182; for the carbon monoxide component it is .0103; and for the nitrogen component we have .7453. As a check on our work we find that the sum of these separate components is unity as it should be. Or expressed in percentages, we would have for a volumetric analysis consisting of 8.6 per cent carbon dioxide, 11.0 per cent oxygen, 1.1 per cent carbon monoxide, and 79.3 per cent nitrogen; that the percentages by weight become 12.70 per cent carbon dioxide, 11.82 per cent oxygen, 1.03 per cent carbon monoxide, and 74.53 per cent nitrogen, which foot up 100 per cent in either case and thus check our work.

A Suggested Form of Tabulation.—To expedite computation the work set forth in the above discussion may be tabulated. Below we have a form of tabulation which will prove useful for such transformations:

Constituents	Volume	Mol. Wt.	mV	$\frac{mV}{C_s}$
CO_2	.086	44	3.782	.1270
O_2	.11	32	3.520	.1182
CO	.011	28	.308	.0103
N_2	.793	28	22.200	.7453
	1.000	$C_s = 29.810$		1.0000



A PORTABLE PYROMETER OUTFIT

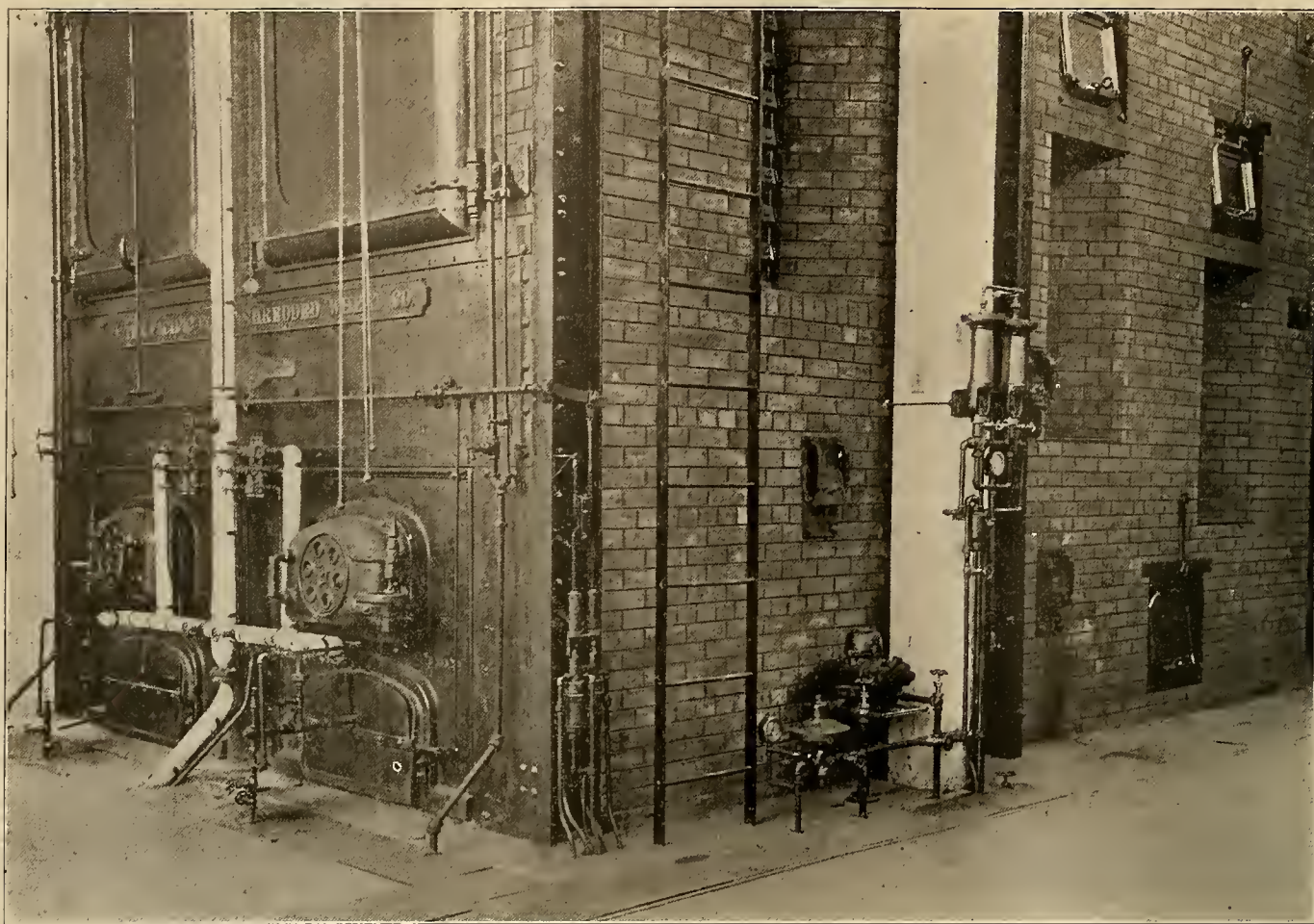
For the ready measurement of temperatures in and about the power plant, a portable type of pyrometer is often convenient. In the illustration shown temperatures may be read from 200°F. to 2200°F. Such an instrument as the one shown is very convenient in ascertaining the flue gas temperatures when the Orsat analysis is being taken.

Weight of Air Theoretically Required for Perfect Fuel Oil Combustion.—For economic combustion in the furnace a certain percentage of air over and above that theoretically required for perfect combustion is necessary. This is due to the fact that it is practically impossible to bring all of the entering air into intimate contact with the heated carbon, hydrogen, and other combustible ingredients of the fuel; consequently, unless an excess of air is admitted some of these ingredients will pass out of the chimney unconsumed. Good practice dictates from 40 to 50% excess air as the proper ratio for economic fuel oil consumption in the furnace.

In order then to know when this ratio is properly established we must have some means of ascertaining the air theoretically required for perfect combustion as well as that actually used in the furnace per pound of fuel.

Correction for Oxygen Appearing in Fuel Analysis.—In the composition of fuels varying quantities of oxygen (O) are found by analysis to be present. While in a sense this is in a free state, still the hydrogen content is reduced in heating value by an amount equal to the combining weight of this oxygen (O) with the hydrogen (H). Experimentally we find that 8 pounds of oxygen combine with one pound of hydrogen. Hence, so far as heating value is concerned and indeed so far as outside oxygen may be required for combustion of the hydrogen, the actual hydrogen content is

reduced in value to $(H - \frac{O}{8})$, where H represents the



THE COMBUSTION CONTROLLER

After the proper admixture of air has been ascertained from the flue gas analysis, the superior qualities of oil as a fuel enable the combustion engineer to properly regulate the entering air, oil and steam with a high degree of accuracy. In view of this fact recent

advances in fuel oil economy have witnessed the installation of master controllers that automatically perform this function. Here is a view of such an installation for the Pacific Coast Shredded Wheat Company in San Francisco.

proportion by weight of hydrogen and O the proportion by weight of oxygen present in the fuel.

Oxygen Theoretically Required for Fuel Combustion.—The oxygen theoretically required is computed from a consideration of the fundamental chemical reactions that take place in the furnace.

Thus, from chemistry we learn that to completely burn one pound of pure carbon $\frac{32}{12}$ ths of a pound of oxygen are required. Again to burn one pound of pure hydrogen 8 pounds of oxygen are required. And in the third place to burn one pound of pure sulphur one pound of oxygen is required.

If now one pound of fuel oil is found by analysis

to contain C parts by weight of carbon, $(H - \frac{O}{8})$

parts by weight of hydrogen, and S parts by weight of sulphur, it is evident that the weight of oxygen required per pound of fuel oil for perfect combustion is from the above discussion

$$\frac{32}{12}C + 8(H - \frac{O}{8}) + S$$

Air Required per Pound of Fuel Burned.—Since air is composed of .2315 parts by weight of oxygen, the theoretical weight of air M_{ta} necessary to supply the oxygen above required for perfect combustion is

$$M_{ta} = \frac{32}{12}C \times \frac{1}{.2315} + 8(H - \frac{O}{8}) \times \frac{1}{.2315} + S \times \frac{1}{.2315}$$

$$\therefore M_{ta} = 11.52C + 34.56(H - \frac{O}{8}) + 4.32S \dots (2)$$

An Illustrative Example.—Fuel analyses are always given in proportions or percentages by weight. In a certain boiler test a sample pound of the fuel oil analyzed as follows: carbon 81.52%; hydrogen 11.01%; sulphur .55%; and oxygen 6.92%. Let us then compute the weight of air M_{ta} theoretically required to burn a pound of this oil.

In applying the formula above deduced, it must be remembered that the symbols there given for hydrogen, oxygen, and sulphur contents are in proportions and not percentages. Bearing this in mind we have by substitution—

$$M_{ta} = 11.52 \times .8152 + 34.56 (.1101 - \frac{.0692}{8}) +$$

$$4.32 \times .0055 = 12.92 \text{ lb.}$$

Having now learned how to convert the Orsat analysis by volume into proportions by weight and also to ascertain the air theoretically required per pound of fuel, we shall in the next discussion determine actual combustion data by means of these stepping stones in computation.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

GETTING RESULTS FROM ADVERTISING

BY H. A. LEMMON

(An advertisement even though it be printed in the bold-est of type and displayed in the most effective manner may not bring you in a dollar's worth of trade. You have not only to say what you want to say, but, more important still, you have to make the other fellow listen. The reason why one ad is good and another bad is a mystery to most people but it is clearly pointed out here in a way which no one can fail to understand. The author is sales manager with the Truckee River General Electric Company of Reno, Nevada, and has had years of experience in practical ad writing.—The Editor.)

Writing an advertisement is condensing a selling talk. Simply that and no more. Because it is in fewer words we must be more careful not to waste them. That is the only difference between the two methods of selling. There is no mystery about ad writing—although there is lots of bunk.

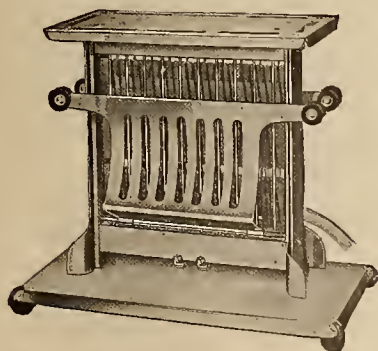
For example, suppose we wish to conduct a toaster campaign, and suppose the particular device we wish to feature lists at five dollars. Maybe we will

ELECTRIC TOASTERS

These toasters are beautifully nickeled and are complete with cord and plug.

You've never tasted *real* toast unless you've enjoyed electrically made toast.

Delivered to your home for \$5.00.



OHM & VOLT "The Electric Shop"

No 1.—An advertisement which, although it looks plausible, will not bring much business

write an advertisement something like the one shown below.

Now worse ads than this have been printed—but not much worse. No matter whether the space it is displayed in be large or small, it positively will not sell enough toasters to pay for itself, because it is all wrong fundamentally.

Even assuming that a sufficient number of people read it—which they will not—it will not excite anyone's imagination, and it is imagination which prompts people to buy goods. Let's start with the second



An electric percolator is not sold on its looks alone, but because of its service in the home

sentence. Suppose I stop you on the street some day and say—

"You've never tasted real toast unless you've enjoyed Electrically-made toast." You will reply—

"All right, what of it?"

And when you merely read the words in print instead of having them spoken to you personally you will not even make that slight mental effort. Perhaps another time I will accost you:

"Say, I've got an electric toaster for sale for five dollars that is beautifully nickeled and complete, ready for use."

Unless you are a very dear friend of mine and therefore inclined to make allowance for my mental deficiencies you will retort:

"All right. What of it?" If I repeat the same idea again you are likely to exclaim:

"Very well, keep it!"

You see the only real information in this ad is that I have something which I wish to get rid of. It is written entirely from my viewpoint in which you, as a possible purchaser, are not in the least bit interested. Let's analyze it further. What is it which I am so anxious to dispose of that I pay out good money to advertise it?

Well, an electric toaster consists of a few feet of nichrome wire, possibly worth 15 cents, a few sheets of cheap metal, some copper wire and bits of porcelain,

probably worth 45 cents. In other words a few cents' worth of junk for which I urge you to pay me \$5.00. And yet hundreds of us are writing advertisements to attempt just that. It can't be done.

So on down through the many electrical devices which in themselves are only so many pieces of wire, tin, aluminum and copper, but each of which, we know from experience in our own homes are invaluable, because of the things we know they will do. Even percolators, although generally appearing to have been built from discarded designs of transformers, are actually worth their weight in gold in almost any household—a fact fully recognized by those who own them.

Another expensive mistake we amateur ad writers seem determined to make is constructing our ads on such general lines that they appeal to no one in particular.

Perhaps imagination of most women is easiest stimulated by thought of their children; others may be wrapped up in their husbands; some may enjoy entertaining friends, and so on down the list of things the feminine mind has reduced to a hobby. Now you can't expect to reach all of these people with their varied interests through one argument. Results will be discouraging if you attempt to work out a special appeal for each and then crowd the mess into one ad. It is like firing on a flock of geese a couple of hundred yards away with a shot gun. Put up the shot gun with its myriad of small pellets, and get out your rifle with its one missile. Then take careful aim at one goose. Having got him and all others in his line load up and shoot again at another one.

It requires much assurance to venture a sample ad and so by way of alibi, let's hasten to assert that the following is not intended to be a real advertise-

ment but an illustration of an alleged principle, to be compared with No. 1.

Now of course, if you have a picture of a little girl to run in this ad so much the better, and if you look over your old cuts you will find one. She may be on a plate with a vacuum cleaner or maybe enjoying the breezes from a fan, but your printer will detach her for you and cut away everything but the desired portion.

The sole object of this proposed ad is to stimulate the imagination of mothers. If the phrase in black type, "Oh, mother, let me get daddy's breakfast" arrests her attention it is a good beginning. It is a still better one if it recalls a fleeting recollection of that last occasion when her little Ruth, or Bessie, or Jennie, asked that she might be allowed to help with father's meal.

If the next paragraph promises, or implies, contrast with her present method of running back and forth to the kitchen stove and suggests to her that she can sit at the table and chat with her husband instead, it has led her imagination to picture and dwell on things which are not specifically mentioned, and so far it is a good ad. The next paragraph about the toast being better and cheaper is not expected to make any definite impression on her mind, but it is hoped that it will kill two possible questions before they are born. Negative mental impressions, in the minds of our intended victims, are dangerous if not dispelled before they are grown up and healthy. And then because it is natural for every brain to resist an invitation to buy we follow that period of doubt (which we have endeavored to make brief by providing for it) with the closing paragraph which we hope will dispel her last effort at resisting the pleasant picture her imagination has painted.

If she loves her home, her daughter and her husband, the word "Companionship" is quite some word and should be effective in conjuring up its own picture. The offer of a free trial should give the unconscious impression of genuineness and sincerity without causing her to think very much about it, especially if we do not mention the price: "A week or so" conveys more confidence on our part than would result if we fixed the time definitely as "Keep it a week." Figures—and no matter what figures—with a dollar sign before them, always cause an antagonistic reaction in the brains of readers of our ads, although of course it is obvious other considerations may be strong enough to overcome them.

Five dollars is entirely too much to pay for some tin and wire but it is very little to pay for a small girl's happy, dancing eyes, a father's joyous pride and a pleasant family companionship.

Each of the devices we are engaged in selling is something more than a mere inanimate bit of metal and porcelain. It is a fairy gift—of no value in itself—but possessing the magical power of bringing ease and comfort, and happiness and companionship, and joyous pride and love and health into the favored home it abides in; and it is these things, rather than scrap metal, which we should offer in our advertisements.

Nobody wants a bit of junk. Everybody wants the fairy gift.

"Oh Mother! Let me get Daddy's breakfast"

***"I can make the toast
right at the table, and
you and daddy can visit
with each other."***

***"The man says it will
be better and cheaper
too."***



**Electric toast brings pleasure and
companionship to the breakfast
table. Try it for a week or so at
our expense.**

OHM & VOLT

"Makers of Sunshine in the Home"

No. 2.—This advertisement makes an appeal to the woman through something she is interested in, and is much more likely to gain you a customer.

MAINTAINING YOUR CREDIT

BY W. R. HERSTEIN

(The jobber's salesman can give you valuable advice—and does on many occasions. Here is a little advice from the jobber's credit man. The article is addressed to other credit men, but perhaps this method of reaching the contractor-dealer at second hand is just an instance of the credit man's tact referred to. In any case, the advice is good and might be taken to heart. The author is a recognized authority on business credits and is general manager with the Electric Supply Company of Memphis, Tenn.—The Editor.)

In the business of merchandising, the sales end takes such great precedence as to result usually in the partial or total eclipse of the credit department. Advice from the credit man is seldom welcome, and even less frequently sought, whereas it is easy to form a mental picture of the salesman facing his customer in the privacy of the latter's office or surrounded by an admiring group of the customer's own friends, and propounding his views on matters of import, beginning with the significance of the latest German peace talk and running the gamut of events down to the advisability of laying in an extra case of Star Plug tobacco or doubling the order for ten-penny nails.

The question, then, which naturally arises is, What are the legitimate subjects upon which a credit man may presume to offer advice? On first thought, the mind reverts to such subjects as conservatism in buying, energetic collections, proper relations between operating expense and gross margin of profit, and the maintenance of a reputable credit rating. To my mind, however, we can render our customers no greater service than to induce them to install a proper accounting system. And by this, I mean not merely keeping a record of bills due from customers and moneys due to jobbers, banks and manufacturers, but an intelligent study of the entire business from the standpoint of profit and loss. The days of chalking up accounts on the door or wall have passed, it is true, but the bookkeeping of many small concerns is still little less crude. Even at this advanced day, when business colleges flourish in every community, when the rural free delivery brings the correspondence school's course to the door of the humblest cross-roads merchant, and when such high authorities as the Federal Trade Commission emphasizes day after day the imperative necessity of correct accounting, there are still thousands of small houses, and a goodly number of larger ones, who are unable to tell until the end of the year whether they are making or losing money; and who, even then, if they have made money, are unable to say just how and where it was made; or, if they are losers, cannot say exactly when and why it was lost.

The making of a monthly profit and loss statement entails such a small amount of labor and expense that it is easily practicable to every merchant, and

from this statement may be readily ascertained with reasonable accuracy the concern's percentage of gross profit and its percentage of operating expense. It is probably true that not one out of a hundred, among the small retailers, has any idea as to how these figures run in his own business, and yet the difference between the two constitutes the measure of his success or the explanation of his failure. This profit and loss statement will show him plainly, month by month, what is happening to his business, and will induce economies, when economy is necessary, much more forcefully than vague and indefinite advice embracing only generalities, and not placing its finger upon specific weak spots.

Here, then, is a fruitful field in which the credit man may labor legitimately and with propriety, both by personal touch with the customer and through the medium of the traveling man. This much, at least, the credit and sales departments have in common: that

whatever makes the dealer a better credit risk, makes him a better customer. "Know thyself" is an injunction of long standing, but equally forceful now as the day it was first pronounced. "Know thy business," it may be paraphrased by the credit man for the benefit of his customer, and surely no advice, solicited or unsolicited, can work for the greater good of both buyer and seller.

CONCLUSIONS DRAWN

In order that the contractor-dealer continue to present himself as a good business risk in the eyes of the jobber's credit man, he should follow a program of:

Better Bookkeeping.

Monthly Statements of Profit and Loss.

Caution in buying.

Efficient Collections of Bills.

The better his business and greater his profit, the better his standing as a customer with the wholesaler.

It is not to be forgotten, however, that much wholesome advice can be offered along other lines than accounting. The cautious credit man can generally tell when his customer is beginning to get into financial deep water. It is then incumbent on him to ascertain, if possible, whether this is due to overbuying, failure to make collections, or some other cause, and if he be a proper credit man he will then, with that tact which is his own particular asset, take the matter up with the customer, carefully explaining the absolute necessity for maintaining an unimpaired credit reputation, and, in consequence, the equal necessity of reducing his stock to meet his reasonable requirements; of requiring his own customers to pay up, or of remedying whatever evil it may be that is beginning to attack the health of the business. Thus it will be seen that it is not sufficient to be merely superficially cautious in the collection of his own accounts; the credit man, in performing this primary essential of his own duties, must look deeper and act as business physician to his customers. To get the money and yet retain the business—this is the true measure of his ability as a credit man; and to do this he must not only be able to become an adviser; he must be eternally vigilant; eternally cautious; watchful and ready at all times to offer that advice which may be the one thing needful to save a valuable account to his house; and at the same time tactful, so that the proffered advice may be accepted in the spirit in which it is extended.

Western Ideas

A **MUTUAL ADVERTISEMENT** scheme was worked up by the Business Professional Women's Club of San Francisco at a recent meeting. Each member was notified to bring samples of the wares carried by the company she represented, and to give a two-minute example of a selling talk. The accompanying picture gives some idea of the exhibit of goods displayed, which ran from pound cakes to electric percolators and reading lamps. The speeches themselves provoked a great deal of interest, partic-



An interesting advertising scheme worked out by a business women's club

ularly an illustrated talk on the application of electricity, with sketches and accompanying limericks. An attractive display of percolators and heating devices, a sample electric iron which showed its interior workings, and a series of reading lamps and electrical fixtures called for inquiries for prices and addresses where the goods might be obtained. A feature of especial interest was found in a traveling lamp socket devised to meet the need of the traveler who found the electric lights inconveniently placed in a hotel room. It consisted of an extension cord and a small fixture which hooked on to a chair back or bed frame with a socket for an ordinary lamp.

The general interest shown and the real advertising value of the exhibit was so apparent that probably the scheme will be repeated at intervals by the club. The idea is a new one and provides a suggestion for the contractor-dealer who is associated in a group with other business men.

NO CONFUSION is found in the display of wares in the shops of Japan. The observant traveler through this country learns much which could find valuable application at home.

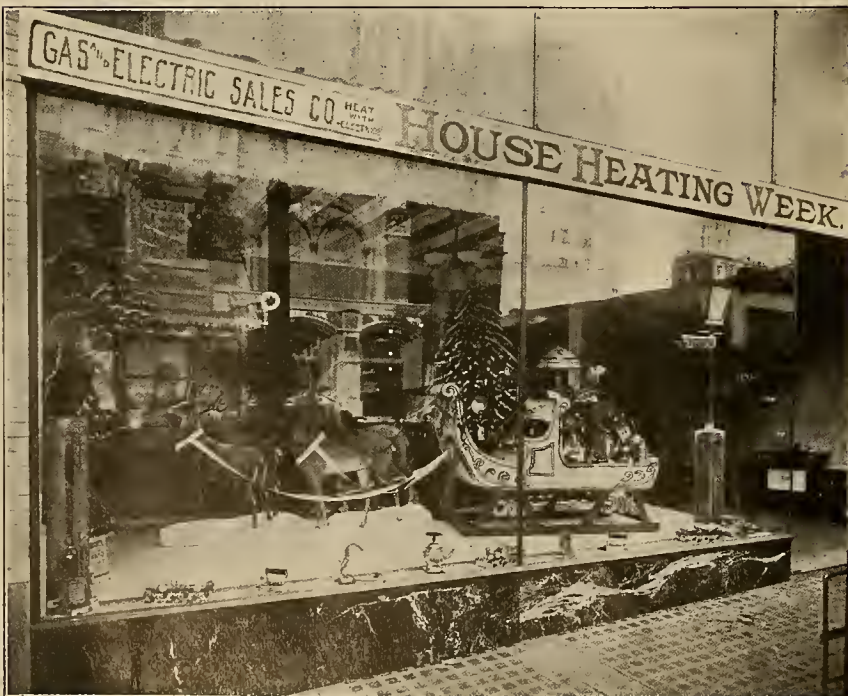
The Japanese, for instance, are masters in window display. Their windows are free from dust, the objects displayed are carefully labeled, and everything is so arranged that the observer is not confused when



This is not a display of electrical ware, but it illustrates a principle that can be used to advantage in any show window.

marketing. Note the clearness and force with which every article presented for sale in the group illustrated is placed in view. The scene is one taken in a vegetable marketing place in Yokohama, but the lesson of neatness, clearness and attractive arrangement is applicable to electric window displays and to the interior arrangements of shops and show cases.

THIS ATTRACTIVE WINDOW DISPLAY called attention to the heating week campaign of this electrical dealer. It was a Christmas sales getter for the Gas and Electric Sales Co. of 441 Sutter St., San Francisco. It represented a snow scene with the traditional Santa Claus, sleigh and reindeer. Santa Claus was supposed to have already descended the chimney of the house which appeared at the left of the window and to be at that moment distributing electric toasters and vacuum cleaners among the stockings found hanging at the mantel-piece. The sleigh is brim to overflowing with electrical wares, some of which have spilled out and have found their way to more conspicuous positions about the border of the window. The reindeer are almost life-size—if the size of a Santa Claus reindeer can be determined from life—and make an attention-compelling display.





AN EFFECTIVE DISPLAY ROOM

One contractor-dealer's association has utilized the office of their secretary and their headquarters in an effective way, by covering the walls with displays from various electrical manufacturers. From household appliances to lamp sockets, a wide selection of wares is presented for the careful study of members or of others especially interested who may come in. A reading table completely stocked with magazines of electrical interest adds to the value of the room. This up-to-date arrangement is that of the California Association of Electrical Dealers and Contractors, room 505, Rialto Building, San Francisco.

A WHIRLING DISC catches the eye of the passers-by and calls their attention to the electric shop of Haller-Cunningham Company, 428 Market street, San Francisco. The sign is perhaps the most striking to be found the length and breadth of Market street, and is one not easily forgotten. It consists of the simple optical delusion of a whirling spiral. Depending on the direction in which it is turned, the

at an angle in the street intersections. It is so arranged that the sign is readily seen from passing street cars and proves an effective business getter.

TO REDUCE BREAKAGE in lamps, a Denver man worked out an ingenious scheme for protecting their tips, as reported in "Factory." He was troubled by the large number of electric light bulbs broken by the workmen. The breakage was not due to carelessness on the part of the men so much as the extreme fragileness of the glass tip of the globe where the glass is sealed. The men would accidentally knock something against the light while handling material. If the blow struck against the side of the globe very few were broken, but the slightest blow against the tip resulted in breakage.

He tried to remedy the trouble by raising the lights, but this impaired the effectiveness of the light so much that the idea had to be abandoned. Finally he adopted the plan of firmly pressing a small ball of putty about the size of a large pea over the tip. The putty baked quite hard in a few minutes and stuck tightly to the glass. The shadow cast by the ball of putty is very slight. Since this was done very little breakage has taken place. Now, the only lights that have to be purchased are those that are to replace those that have burned out.

A DOLLAR is a good thing to have, particularly when all you are asked to exchange for it is an idea. As announced in the last issue, the Journal of Electricity is prepared to pay a dollar for a description of some new idea in window display, business getting or better ways of doing it in the contractor-dealer's business. Take a picture of your scheme or that of your neighbor and send it in with an account of what it means, and the Journal will be glad to send you the dollar for such as are available for use in its columns.



A sign that takes advantage of the popular interest in an optical delusion

rings of color appear to be widening out from the center to the edge and dropping off the edge of it into space, or narrow down and disappearing in the center like a funnel. If you have never witnessed this effect, try it with a spiral on a card, balanced on a pin in the center. To add to the interest, two lights at the ends of radii revolve at the same interval. The picture shows the advantageous location of the store

IS MEMBERSHIP IN AN ELECTRICAL CONTRACTOR AND DEALER ASSOCIATION OF ANY VALUE?

BY W. M. DEMING

(Contractor-dealers who are not members of their local associations are asking themselves that very question—and occasionally those who do belong are pessimistic enough to ask themselves that question, too. The answer is dependent on the attitude of the man who is to be the member—but for the wide-awake business man who looks forward to getting ahead, the answer is here given definitely in the affirmative. It pays to be a member because—but read the article.—The Editor.)

The answer to this question may be "yes" or "no," depending entirely upon the individual case.

If the contractor or dealer has no desire to increase his business and make it more profitable—in fact in many cases it would not be amiss to say "make it profitable"—or takes no pride in being successful, affiliation with the association is of no value whatever.

On the other hand, for the contractor or dealer who, no matter how small his present resources, wishes to advance himself and his business, membership in the association offers valuable opportunities.

In many respects the contractor-dealer is a public servant, just as the railroads, or gas, electric, telephone and other public utility corporations which serve their respective communities. In view of the rapid development and frequent radical change of ideas in the electrical industry, it is essential that the successful contractor-dealer of the future keep well abreast of the times if he would give the public the reliable advice and service to which it is entitled.

The local association, through its affiliations with various state and national associations, provides a ready means of keeping in touch with progressive ideas throughout the country. It further permits of careful co-operation, study and discussion of local problems.

Co-operation, as we now understand it, does not mean a price-fixing arrangement, or a combination contrary to public policies or the consumers' interests, but instead, its purpose is to improve the conditions of the business, promote its growth by legitimate means and instill pride in everyone concerned in it over their share in the development. Mere passive membership in the association, however, is not sufficient, and to accomplish results each must do his share of the work and not be like a team of horses I once heard described. Someone asked their owner how they worked together, and he replied: "Fine! One seems willing to do all the work, and the other seems willing to let him do it."

Now, that sort of team work will not accomplish results. We know that the strength of a chain is equal to that of its weakest link only. Therefore, unless each one of you considers himself as a link in the chain that, if you please, constitutes or represents your association, and proceeds to strengthen himself individually, he is doing an injustice to his fellow members besides handicapping himself.

You may attend your quarterly or annual meetings regularly and listen to what is said there, but is the sole object of your associations a lecture bureau? There are progressive ideas abroad in the world today which are revitalizing the life and activities of all

branches of the business. Have you individually grasped these larger ideas and appreciated their direct bearing on your individual interests? Ask yourself whether you as an individual or as a component part of your association, are contributing to the solution of the problems presented to you. The executive officers alone cannot vitalize a comatose body. "Letting George do it" puts no one but George on the map. What is needed is the active force of each individual with an idea that the whole structure of your association will fall if one fails to do his share. Of course it means a cost to you, principally of time and effort, but—what is worth while that costs nothing?

Don't be the weak link in the chain. You cannot expect the Central Station, for instance, to discontinue the activities of its merchandising department at one point and not at another, for then its stockholders' interests again become paramount in that the expense of operation of the department cannot be correspondingly reduced. You must, in other words, show that you are capable of taking the lighting company's place in the merchandising game throughout the area it covers.

You may say that you haven't time to follow all these suggestions, but if you don't take the time now, will you ever be able to? And what will you do when the fellow who has taken the time comes into your field and shoves you to one side?

There is marked tendency on the part of manufacturers to advertise the contractors and dealers through publications such as the Saturday Evening Post, etc. Are you prepared to cash in on this?

The world war is already bringing up new problems in bewildering and rapid succession. There will undoubtedly be prosperity after the war is ended, but it will be on the basis of keener competition and closer margins of profit. Therefore, make up your mind what you must do to meet the situation and do it quickly and thoroughly. You will then find both the Central Station and the manufacturer standing shoulder to shoulder with you at all times.

The following extracts from a statement of the principles advocated by a joint committee of the Electrical Contractors and Jobbers in New York City are of interest in this connection:

Principles Advocated by a Joint Committee of Electrical Contractors and Jobbers in New York City.

It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition. As this is due largely to lack of proper co-operative effort on the part of the different branches of the industry, it is the belief of the committee that, with a proper organization whose primary interest is to educate its members to a greater responsibility, much good can be done in the way of properly serving the consumer and of creating a desire on his part to use electrical appliances and to adopt the idea, "Do it electrically."

As examples of what can be accomplished, we only have to review the work of Improvement Clubs, Societies, Chambers of Commerce, and similar organizations throughout the country. To state the proposition is its proof that individuals cannot conceive and inaugurate reforms and changes in business methods, permeating a whole industry, but must depend upon

organized effort, under effective leadership.

The Central Stations, through their strong organization, the National Electric Light Association, have brought the lighting and power industry to a high degree of development and while doing so, have reduced rates to the consumer—neither of which could possibly have been accomplished through individual effort.

Electrical engineers, through the American Institute of Electrical Engineers, have been better prepared for their work through fuller knowledge of the requirements to be met and of the means of fulfilling them. This institute is conducted purely for educational purposes and without individual profit to its members, except in-so-far as they improve themselves by participating in the work.

Electrical manufacturers and jobbers through co-operative work have done much toward educating themselves, and as a result have placed their business on a firmer, more economical and more satisfactory basis. It has been proved through this work that, notwithstanding the increased cost of living and the consequent increase in the cost of almost every known commodity, the cost of electrical appliances has been steadily reduced and the quality of the article steadily improved, except during temporary war conditions. The principal effort on the part of these industries has been toward educating their members to the necessity of efficiency in order that the various branches may operate their particular business at a minimum of expense.

Architects have the American Institute of Architects as their National Association. We would hardly recognize as progressive an architect who is not a member of this Institute. Some of his most valuable information is obtained through such membership and his affiliation with other architects in association work.

Although electrical contractors have their National and State Associations, which have done much to educate their members in the proper conduct of their business by frequent meetings and interchange of ideas, yet the electrical contracting industry, taken as a whole, and viewed in the light of the modern acceptance of the meaning of organization, is totally unorganized.

The time approaches, however, when the beginnings of true organization will take place and efforts will be made to bring every contractor-dealer from ocean to ocean under the fostering care of a great national organization whose duty shall be to bring order out of chaos and establish close co-operation with jobber, manufacturer and Central Station.

Such an organization will do for the contractor-dealer what the N. E. L. A. has done for the Central Station; what the A. I. E. E. has done for the engineer; what the A. I. A. has done for the architect, and what the Electrical Supply Jobbers' Association has done for the jobber.

THE NEED FOR ORGANIZATION

BY E. H. EARDLEY

If there ever was a time in the history of the world when a crying need for an association existed, it is now, whether in my town or yours, whether you

are enjoying prosperity or not. An association is a very necessary and vital adjunct to any and all business. Today, we may feel happy in the thought that fortune is smiling upon us, and that we are secure in our present prosperity, but what about tomorrow? Are we absolutely sure of our position? Do we control the ebb and flow of that which contributes this prosperity? Recently business men of our country appeared before the Federal Trades Commission to unburden some grievances, supposed and otherwise, to ask the government to help them in their affairs. Upon investigation, it was discovered that many who would enjoy such help as the government could give, were wholly unprepared to give any facts or figures that would materially assist the government in remedying the faults or changing conditions. This condition is reflected in every branch of commercial activity—very noticeably so in our industry. We cannot know our profits without knowing our costs, and to actually know costs requires the most careful scrutiny, a more careful vigil than most men are wont to give. It is no wonder that over a hundred thousand concerns in this country had no net income during 1914, with another ninety thousand making less than \$5,000.00.

A careful, consistent business man is a more vital asset to a community than a poor one; in fact his worth is just in proportion to the extent that he knows his business. He employs capital and labor and increases the wealth of the community. He takes an active interest in its affairs; he contributes morally and financially to its upbuilding, and becomes a substantial member. On the other hand, the fellow who, in ignorance, cuts into his profits by reason of not knowing his costs, underprices his merchandise, and impairs the business of his competitors at the same time that he ruins his own.

I feel safe in saying that the business man of the future will be the man who has known his costs, consistently maintained his price and efficiently conducted his affairs and kept his standing in some good association. While the other man who "guessed" will be "Brother to the Rocks and Stones," and have no place in the commercial world.

An association is not only desirable but an absolute necessity and can be conducted openly and above-board and in full view of the city, state and government officials. If we of the electrical industry are to have our place in the world's work, and enjoy the fruits of our labor, we have got to associate, unite together, and have more in common; costs, methods and information must be more generally disseminated. We must have a broader view and more enthusiasm. There is a crying need for more intensive effort, business conducted along broader lines, and a realization that our individual business, whether large or small, is but a part of a whole, and that we do not and cannot live unto ourselves alone.

Difficulties now existing must be solved among ourselves, from within, and not from any other source.

Organization and co-operation are the twin words which stand for improvement, advancement and growth which will in turn solve our problems, unite our forces and lend the dignity to our work, that we so much desire.

CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

A definite plea for action for the California co-operative educational and merchandising campaign was adopted at a meeting of the advisory committee held at Los Angeles on January 3rd and 4th. This committee consists of Lee H. Newbert (chairman), Pacific Gas and Electric Co.; G. E. Arbogast (vice-chairman), electrical contractor at Los Angeles; H. C. Reid, president California Association of Electrical Contractors and Dealers; A. E. Wishon, San Joaquin Light and Power Corporation; R. M. Alvord, General Electric Co.; M. L. Scobey, Home Electrical Co., San Francisco; D. E. Harris, Pacific States Electric Co., and G. B. McLean, Southern California Edison Co., with J. W. Redpath of the California Association of Electrical Contractors and Dealers as secretary.

This committee was authorized to act by the executive committee of the Pacific Coast Section of the National Electric Light Association after adopting the plan approved by the contractor-dealers and the jobbers, and after assurance had been given that \$12,000 would be available for the first year's activities. It is charged with the direct conduct of the campaign and the selection and supervision of the field men.

Mr. A. L. Spring, formerly of the Western Electric Co. at Los Angeles, has been employed as field man for Southern California. Announcement will subsequently be made of the field man for the northern part of the state.

The committee in considering the plan outlined by the commercial committee, and also considering more in detail the things which are to be accomplished, feel that the development of a closer co-operation and understanding between the central station employees and the dealer-contractors and their employees is an essential foundation to future development and educational work. It shall, therefore, be the committee's object to bring about a better understanding of the duties of the contractor-dealer and of the central stations to each other, and to cause the individuals affiliated with every branch of the electrical industry to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry. Following this foundation work which the committee considers necessary, will come the accomplishment of the objects specifically outlined by the commercial committee, namely: to stimulate the sale, installation and use of all kinds of current consuming electrical devices; to originate a suitable trade mark for the California Association of Electrical Contractors and Dealers and promote its use in electrical advertising; to help the contractor-dealers to improve their business methods, including accounting, sales, advertising and general store appearance, and finally to elevate the retail side of our industry to that position in the commercial world to which it is justly entitled.

The advisory committee expects to secure the co-operation of the organizations (particularly the salesmen) of the manufacturers and jobbers, to give favorable publicity to this plan throughout the state.

It is proposed to immediately initiate a campaign or contest to secure a suitable trade mark for the Cal-

ifornia Association of Electrical Contractors and Dealers.

The committee is planning to supply to the contractors and dealers throughout the state suitable blanks on which they may report the electrical appliances sold by them each week. The contractor-dealers will be asked to mail these reports in duplicate to the office of the committee, one copy to be forwarded by the committee to the proper central station. Contractor-dealer reports of prospective central station business will also be provided for.

It is planned to immediately employ two field men who, working under the direction of the advisory committee, will execute the plans and policies of the committee according to the following general outline:

1st. Field men will visit and work in various towns throughout the state as directed by the committee, and will make reports from time to time direct to the committee at headquarters, as may be required. The field man working in Southern California will send a duplicate copy of his reports to the vice-chairman in Los Angeles.

2nd. Wherever it seems desirable, the field man will arrange in the town visited for a joint meeting of all electrical men, for a discussion of their general interests and problems. By sufficient previous arrangement, the advisory committee may furnish suitable speakers for such meetings. It is the purpose of the advisory committee to make preliminary arrangements in the larger towns so that this meeting may be held on the first day of the field man's visit to that town. These arrangements will be made by correspondence through the secretary's office, and with the assistance of central station managers and dealer-contractor members.

3rd. The field man will visit the central station managers and employees in his endeavor to influence them to closer co-operation with the contractor-dealers and their association.

(a) He should promote better acquaintance between central station employees and dealer contractors.

(b) The central station manager will be asked to indicate to his central station organization that it is his company's policy to support this co-operative campaign.

4th. The greater portion of the field man's time in the town, however, will be spent with the dealers and contractors in assisting them in their efforts to improve their business methods, including accounting, sales, advertising and general store appearance, and also to secure their closer co-operation with the central station in their town.

(a) He will show the advantages of the retail end of the business and thereby encourage the dealer-contractors to give more attention to it.

(b) He will bring to their attention good merchandising methods.

(c) He will encourage the proper arrangement of stores and show windows, particularly by showing photographs of well arranged stores and windows, and by assisting the dealer-contractor with his plans for improved arrangements.

(d) The advantages of tying in with national publicity campaigns and with central station advertising campaigns will be explained.

(e) The dealer will be encouraged to use good advertising material furnished by manufacturers.

(f) The dealer-contractor will be encouraged to take up the study of proper accounting methods.

(g) The field man will show to non-member dealer-contractors the advantage of membership in the California Association of Contractors and Dealers.

(h) The contractors will be encouraged to use high quality of material and workmanship and standard practice methods of estimating cost of installations.

(i) The field man will endeavor to convince the contractor-dealer of the advantage of a closer co-operation with the central station and the central station employees.

(j) The former will undoubtedly cause them to realize the necessity of preferred attention to work which they are given to do for central station account.

(k) Contractors will be urged to install sufficient outlets for the convenient use of all electrical appliances.

(l) As a necessary adjunct to the closest co-operation with the central station, contractor-dealers will be asked to make reports for the benefit of central stations of appliances sold and of prospective business.

SOME OF THE MEN WHO ARE TODAY MAKING CONTRACTOR-DEALER HISTORY IN THE WEST



L. H. Newbert, head of the commercial department of the Pacific Gas and Electric Company, is chairman of an advisory committee on electrical merchandising in California. This committee has at its disposal twelve thousand dollars in voluntary subscriptions from jobbers, manufacturers' agents, central stations and electrical contractor-dealers, which is to be used in an intensive study of merchandising in this field. The idea is an original one in the West, and it is believed that the results of its research and study will lead to new and more profitable methods in the West, and establish efficient methods well worthy the careful consideration of other districts of the nation.



R. M. Alvord, manager of the supply department of the General Electric Company's San Francisco office, is chairman of the commercial section of the Pacific Coast Section, N. E. L. A. This section is now preparing a series of extremely valuable papers of much interest to the problems of the electrical contractor-dealer. These papers will be presented at the Del Monte Convention of the Pacific Coast Section, which convenes April 24-27, 1918. The papers will be published in full in the columns of the Journal of Electricity prior to the convention gathering.



D. E. Harris, vice-president of the Pacific States Electric Company, a member of the executive committee of the Pacific Coast Section, U. S. L. A., and of the advisory committee on research investigation in electrical merchandising methods in California. Mr. Harris has from the beginning been an enthusiastic proponent of the educational campaign for better merchandising methods in the West, and to his enthusiasm much credit is to be given for the present intensive educational campaign now under way in this state.



E. H. Eardley, secretary of the Utah Society of Electrical Contractors and Dealers. Mr. Eardley is increasing the efficiency of the contractor-dealer in his district by introducing new ideas in cost keeping and in computing bids for work.



Allen S. Halls, state chairman of the Oregon Association of Electrical Contractors and Dealers. Mr. Halls has had broad experience in electrical construction work of all kinds and is a leader in the upbuilding of the electrical business in the Northwest. Under his guidance the Oregon Association looks forward to continuing and broadening the progressive policies of the last year.



J. Willis Oberender, secretary-treasurer of the Oregon Association of Electrical Contractors and Dealers, is formulating new and comprehensive plans for his association in the Northwest. A lawyer by profession, Mr. Oberender is putting to a most useful purpose this excellent training by helping to solve the problems of the electrical contractor-dealer.



H. C. Reid, President California Association of Electrical Contractors and Dealers. Mr. Reid is proving an exceptionally able executive in forwarding better co-operative relations between the contractor-dealer and the manufacturer's agent, the jobber and central station.

PROFITS IN WIRING A SMALL COTTAGE

BY BLAINE GREY.

(Just how it is possible to fool yourself into thinking you are making a profit when in reality you are losing money, is here pointed out as one of the easiest pitfalls into which a contractor-dealer may fall. The experience of a contractor actually in the business, as to what price is necessary for the making of a profit on small house work, makes valuable reading for others who may be taking up similar work.—The Editor.)

This is the story of wiring a small cottage about 28x53 feet and one story high. In this house there are forty-six outlets, counting ceiling outlets, wallplugs and switches. According to the schedule I have been using for a job of this kind, I would charge \$1.50 for each outlet. Forty-six outlets at \$1.50 each would amount to \$69.00.

On the face of it one would think I was getting a fine price but, as a matter of fact, money will be lost by any firm that continues to do work for these prices. A person doing his own work can make wages, and good wages, at this figure, if wages are all that is desired. But working for a firm of standing would bring far greater returns after a number of years, because the wages would be steadier day after day.

I hope to show you that any dwelling house, cottage, or any building of this type, cannot be roughed in at a profit, if only \$1.50 an outlet is charged.

In this particular house of forty-six outlets, it came to pass that the following labor and material were used: Thirty hours labor, or an average of a little better than twelve outlets per day. It might seem to you that twelve outlets are not enough for a day's work, but any man who puts in twelve outlets a day and does them right is a good enough man to work for me. I also want to say right here that good work and equitable prices religiously followed are substantial stepping stones toward success.

Thirty hours' labor for forty-six outlets at 70 cents an hour is \$21.00. Twenty-one dollars representing day wages, is the profit some of us would make, and nothing more, but the price we pay is calloused hands and weariness when night comes; and, after years of effort all we have gained are these same wages, long since gone, and a bunch of wasted years, and yet we wonder why.

A few cold figures for a minute:

30 hrs. labor at.....	\$0.70	\$21.00
1280 ft. No. 4 wire at.....	.012	15.36
68 ft. loom at.....	.03	2.04
200 Nailit Knobs.....	.026	5.20
350 bushings and tubes.....		3.50
18 switch boxes.....	.17	3.06
40 ft. conduit ¼ at.....	.11	4.40
12 ft. conduit ¾ at.....	.14	1.68
2 ¾ condulets at.....	.61	1.22
35 ft. No. 10 wire at.....	.027	.94
Inspection.....		3.20

Incidentals:

Rubber and friction tape, nails, straps, solder, locknuts and bushings, screws, loomclamps, groundclamps, paint, oil for threading pipe.....	2.40
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\$64.00

Sixty-four dollars is the actual cost of this job in dollars and cents. The cost of each item may be a little high or a little low, but on the whole, if good material is used, and not something "just as good," these prices will be found to be about right.

Now, after a time, in some cases right away, and in other cases anywhere from thirty to one hundred days, we get a check for \$69.00. Five dollars more than our actual cost. Where is overhead? We all

know that 20 per cent is a fair average overhead; 20 per cent of \$69.00 is \$13.80. The cost of the job is \$64.00. The cost of labor and material, plus overhead, is \$77.80. We receive \$69.00. Therefore we lost \$8.80 on this particular job, and will likewise lose on any other job taken at \$1.50 an outlet. We go along thinking we are making money until some fine day a credit man, with no human side to his character, says, "Settle Up," and all we have to offer is misdirected effort.

We see this contractor and that contractor legitimately enjoying the better things of life. We should not kid ourselves and say the opportunity was theirs. There are three shining stars in the intermountain district in the electrical contracting field. Each of them started business on a small scale. Why is success theirs? Why do they enjoy the fullness of their efforts? Because: Early in their career, when they were infants in the business, they learned the lesson that success in business is obtained by combining quality and service with profit.

UP TO THE MINUTE METHODS IN COST FIGURING

(The profits to be made from cottage wiring are the source of a considerable part of a contractor's income—that is, if he succeeds in making profits. This report of a recent meeting of the Utah Society of Electrical Contractors and Dealers at which this subject was discussed is evidence of the value and interest of these meetings. How to figure your costs so that your profits will turn out what you expect is here pointed out.—The Editor.)

The Salt Lake Division of the Utah Society of Electrical Contractors and Dealers holds regular meetings every Friday noon, at the Salt Lake Commercial Club.

These meetings are devoted to analysis and discussion of the numerous problems which must be solved and thoroughly understood by the contractor and dealer before he can effectively maintain his proper relation to the electrical industry or make his business profitable. The great value of the opportunity thus afforded for a frank and complete exchange of ideas, and a better understanding of each other, is already apparent.

The subjects to be discussed at each meeting are announced in advance to permit of individual study beforehand if desired.

The program for December was devoted to consideration of the costs and profits on small cottage wiring. That there is more or less misunderstanding as to what should be included in the cost when figuring profits, was clearly shown by analysis of several specific contracts. In one case the contract price being \$77.00, and the actual cost of labor and material \$53.64, the contractor claimed to show a net profit of 33 per cent. Had he included his overhead expense (which in this instance amounted to approximately 3 per cent), as he should have done, the contract would show no profit whatever.

In another case, the contractor having determined that his overhead expense amounted to 25 per cent of his selling price, had been increasing his actual cost for labor and material by 25 per cent to cover this item and, wondering why his actual profit did not correspond with his estimated figures.

Association work of this nature cannot fail to be of great value to the members and the public in general.

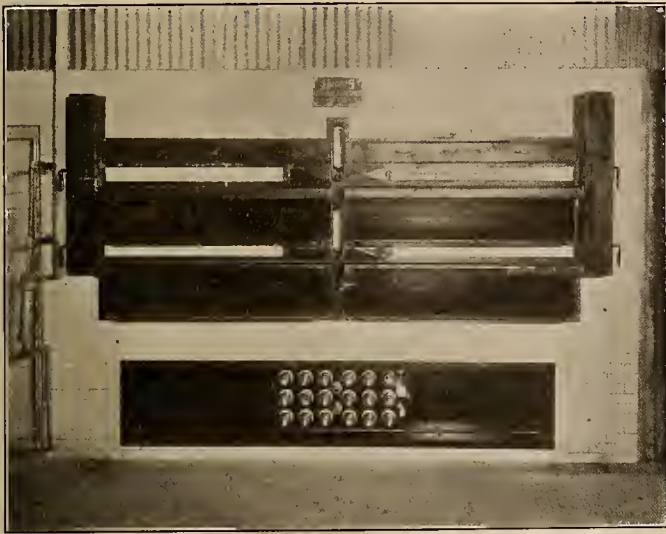
BAKERY USES 650 LOAF ELECTRIC OVEN

BY F. D. WEBER

The first large electric bake oven to be installed west of Salt Lake City has been installed in the plant of the Haynes Foster Baking Company, Inc., 64-66 East Seventh Street North, Portland, Oregon. This oven was installed through the sales department of the Northwestern Electric Company, who furnish the electric service.

The oven is a Hughes No. 415 and the installing was supervised by the Hughes Electric Heating Company. Some minor changes in design have been made from the previous standard construction of this type, at the suggestion of the manager of the Baking Company.

The oven has a capacity of 650 12 oz. loaves per baking and is a continuous baking oven.* It consists of two baking chambers, one above the other, each



AN ELECTRICAL OVEN IN A PORTLAND BAKERY

The economy of space as well as the ability to regulate the exact heat in all parts of the oven are among the recommendations of an electric oven.

chamber being heated from both top and bottom. By the proper spacing from front to back of the heating elements, the heat distribution over the entire oven

is uniform and any part of it can be increased or decreased at will. The fact that the two chambers of the oven can be built one over the other is a decided point in favor of the electric oven over any other type, as this feature can be made use of to save room.

The size of the chambers of the oven is 114 in. by 134 in. on the inside. The brick walls are 17 in. thick, eight inches of which is composed of nonpareil brick to furnish thorough heat insulation, manufactured by the Armstrong Cork Brick Company. The inside is lined throughout with 1/8-in. boiler plate, and the outside is finished with white enameled brick.

The electric power used is a.c. 220 volts, 3-phase, 60 cycle, and the total current that can be used at any one time is 210 amperes, the heating elements being balanced between the three phases. The electric service is brought into the bakery in iron conduit to the main line switch, and the fuses are in an iron cabinet mounted on the wall at the side of the oven. From the main service cabinet the service is continued in iron conduit to the long iron cabinets in the front of the oven just under the front doors of the oven. From this cabinet the elements of the heat units are served by two wire circuits each protected by two pole fuses.

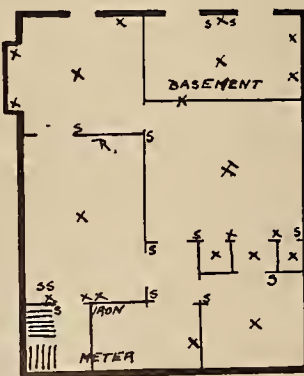
The wire used, where high temperatures exist, is a specially insulated Deltabestan wire. The oven is electrically lighted, the lights being placed in the side walls and protected by double plate glass covers. All of the wire is placed in conduit, where possible, and some is run on the surface for accessibility; also all the electric equipment is readily accessible from both front and back.

The heating units consist of six heat units, each divided into three separate sections, with each section controlled by a three heat snap switch located in the iron cabinets in the front of the oven. Each element is removable through the front doors of the oven. The oven is equipped with a mercury thermometer for registering the temperature on the inside. The temperature used is from 400 to 500 degrees Fahrenheit. Humidity is produced in the oven by the use of steam, the steam ventilating flues being over the front doors.

The weight of the oven is 45,000 pounds and its cost approximately \$5,000.

A LEAF FROM A CONTRACTOR'S NOTE BOOK

It is obvious that this contractor thought he was doing business at a profit—the profit of \$23.36, in fact. As a matter of cold business, if he had allowed the necessary 30 per cent of the selling price for overhead, he would have found that this amounted to \$23.10 and that he had made no profit at all!



Used:-

90 ft. #8 R.C. wire. . . . 3.50
700 ft # 14 " wire. . . 8.05
60 ft - 1/4 loom . . . 2.40
12 single Sw. boxes . . 1.92
2 - 2 Gang. . . . 1.32
17 ft. - 1/2 conduit. . 1.70
26 - 3 in boxes . . . 1.06
6 - 3/8 fix studs. . . . 24
5 - 1/2 Caplets . . . 50
8 bolts and nuts. . . . 40
10 Tp. 1 wire cleats . . 50
160 handles . . . 4.50
175 latches . . . 1.35
5 ft. 1 in Cond. . . . 25
2 " 1 in Cond. (10) . . 100

27

$\frac{1}{2}$ lbs. bell wire \$.30
 $\frac{1}{2}$ " frict. tape .10
 $\frac{1}{4}$ lb. rubber .10
 nails, leather
 paint .25

Permit - - - $\frac{3.25}{4.00}$

May Cost - \$53.64

Contract \$ 77.00

Profit \$ 23.36

$$\begin{array}{r} 77 \overline{) 23.86133} \\ \underline{231} \\ 761 \\ \underline{761} \\ 000 \end{array}$$

1

That the Haynes Foster Baking Company is satisfied with its installation is testified to by an enthusiastic letter written by the president to the sales manager of the Northwestern Electric Company.

A similar oven is being used by one of the largest wholesale bakeries of Omaha—and another is in use at the Great Lakes Naval Training Station near Chicago. There is no question but that electric baking will in the near future be quite general on the Pacific Coast where hydroelectric power enables the baker to purchase power at a low rate.

The Hughes Electric Heating Company have made the following installations during the present year:

Two at Salt Lake City—Vienna Baking Company.

One at New Orleans—Gunwall Hotel.

One at Great Lake Training Station.

One at Milwaukee—House of Correction.

One at Lincoln, Neb.—Gooch Baking Company.

At some later date complete test data on this oven will be available and be published in this journal.

U. S. STEAMBOAT INSPECTION SERVICE

(The Pacific Coast has become the center of recent ship building activities and contractors are called upon to wire ships designed for English, French and American use. It is important, therefore, that they be familiar with the various rulings under which such work must be done. The following code covers wiring work on steamboats designated for river and coastwise use in the United States, as well as in some cases for ocean-going vessels.—The Editor.)

River, Ocean and Coastwise Boats

1. On all vessels contracted for after June 30, 1916, using electricity for lighting, the installation shall be in keeping with the best modern practices.

2. Wires shall be run in approved iron conduits, armored casing, or molding.

3. Iron conduit or armored casing shall be required in bunkers, cargo spaces, storerooms, etc., and in all places where the leads are liable to mechanical injury. Joints in wiring shall be avoided as far as possible in the above-named spaces. Where wires are led through beams, frames or nonwater-tight bulkheads, they shall be carried either in iron conduits, armored casing, or protected by hard rubber, or other equivalent bushings.

4. Where wires are carried through water-tight decks or bulkheads, they shall be provided with a suitable stuffing box at deck or bulkhead. Where such points are liable to mechanical injury they shall be protected by suitable boxes or cages.

5. In locating the wiring system as a whole, care shall be taken to provide accessibility for examination and repair. Special care shall be taken to avoid any arrangement which might permit the lodgment of standing water.

6. All taps, joints, and splices shall be fitted with water-tight junction boxes.

7. Joints shall be so spliced or the parts so joined as to be both mechanically and electrically secure without solder. They shall then be soldered and properly insulated and further protected by water-proof tape.

8. Changes or alterations in the electrical installations of vessels now in service shall be in accordance with this rule.

9. Special attention shall be given by the inspectors in the examination of present installation to see that it is of such nature as to preclude any danger of fire, giving particular attention to wiring which is carried through wooden bulkheads, partitions, etc.

10. On all ocean vessels under the jurisdiction of the Steamboat Inspection Service making voyages of more than 48 hours' duration, the entire steering gear, the whistle, the means of communication and the signalling appliances between the bridge or pilot house and engine room shall be examined and tested by a licensed officer of the vessel within a period of not more than 12 hours before leaving port. All such vessels making voyages of less than 48 hours' duration shall be so examined and tested at least once in every week. The fact and time of such examination and test shall be recorded in the ship's log book.

ECONOMIZING BY USING ELECTRICITY

Effective advertising as recently carried out by the Utah Power and Light Company, should prove a sales builder not only for the central station, but for the retail dealer as well. The argument for the West as a user of hydroelectric service is ably presented.

As they point out:

The generating of hydro-electrical energy requires no fuel.

Even the water turning the wheels of the enormous power plants is not consumed or contaminated, but returns at once and without diminution to its natural channels.

To curtail your use of electric service—or to fail in utilizing electricity to the very fullest extent in business and in your home, is to fail in doing your full share to support the government's fuel conservation policy.

There are many uses in every business and in every home for electric service, where a direct and material saving of coal will result.

Electric cooking and electric ironing are important factors.

In 2200 residences, hotels and restaurants throughout this company's territory, electric service is being used today for cooking. And by using electricity for this purpose these 2200 consumers are saving the government 30,000 tons of coal annually.

If 22,000 consumers used electricity for cooking the saving would be 300,000 tons of coal annually.

Electricity's Part in Fuel Saving

So serious is the coal shortage throughout the United States that it has become the patriotic and imperative duty of each individual to aid to the utmost in the conservation of commercial fuel.

This can best be done by the use of Electricity, generated solely by water power.

The generating of hydro-electrical energy requires no fuel.

Even the water turning the wheels of the enormous power plants operated by this Company is not consumed or contaminated, but returns at once and without diminution to its natural channels. During the present year—1917—the Utah Power & Light Company generated 500,000,000 kilowatt hours of electrical energy, which in its many uses is doing work in the mines, factories, farms and homes of this great intermountain territory that otherwise would have necessitated the use of 1,000,000 tons of coal. It would have required 25,000 coal cars and more than 500 locomotives to have transported this vast quantity of coal to the consumers.

To curtail your use of Electric Service—or to fail in utilizing electricity to the very fullest extent in business and in your home, is to fail in doing your full share to support the government's fuel conservation policy.

There are many uses in every business and in every home for electric service, where a direct and material saving of coal will result.

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In practically every industrial pursuit in the intermountain west electricity is simplifying manufacturing processes, abolishing wasted effort, increasing production, cutting operating costs—and SAVING FUEL.

Utah Power & Light Co.
Efficient Public Service.

A half-page advertisement that sells the electric idea

throughout this company's territory, electric service is being used today for cooking. And by using electricity for this purpose these 2200 consumers are saving the government 30,000 tons of coal annually.

If 22,000 consumers used electricity for cooking the saving would be 300,000 tons of coal annually.

Technical Hints

BY GEORGE A. SCHNEIDER

(Often complaints of heating devices can be traced back to the use of the heater under too low voltage. A suggestion is found here for the contractor who may suggest the installation of separate circuits for heating devices. A discussion of accounting systems and of allowances for overhead and profit will prove of particular value in view of the present interest in the contractor-dealer movement.—The Editor.)

NOTES ON THE DEALER-CONTRACTOR MOVEMENT

During the past few years a great many articles dealing with the problems of the electrical dealer and contractor have appeared in the various trade journals. These articles have been supplemented by many excellent talks and lectures before the various electrical associations interested in this work. Practically every phase of the business has been discussed time after time so that now little that is really new can be said on the subject. However in the past few months the movement has been brought more forcefully before the electrical fraternity than ever before. Formerly the real effective work was done in practically only one section of the country. Now the movement is rapidly becoming a national one.

A brief analysis of the business methods of the average electrical dealer and contractor, especially those doing a small business, will almost invariably bring forth at least two or three facts which seem to stand out more prominently than all others; namely,

(a) Many dealers and contractors do not have an appropriate accounting system or do not have any at all and therefore do not have any accurate means of knowing their cost of doing business or arriving at an intelligent price for a job.

(b) Many dealers and contractors do not give sufficient attention to the financial side of their business and do not make the best possible use of their available working capital.

(c) Only a few contractors are doing real constructive work towards promoting the electrical industry. Not enough of them are making use of the sales helps which are supplied without charge by the various electrical manufacturers and jobbers.

Many contractors will admit that they may be a little negligent in handling their financial matters, especially in making their collections, but few of them will agree that their methods of figuring jobs or cost of doing business are at fault. Their particular claim seems to be that their overhead expenses are less than those of their competitors whereas it will often be very apparent that many who make such claims do not really know just how to estimate overhead expenses, neither do they know just what items of expenses should be included in the overhead. Then some, while admitting that they have more or less overhead expense, do not really know how to make suitable allowance for it in arriving at the price to place on a given job. Some of the ideas about overhead expenses are indeed peculiar. For example, just recently a contractor tried to explain to the writer that he had practically no overhead expenses due to labor charges because during his odd moments his construction foreman did repair jobs which practically paid for his salary.

The question of overhead expenses seems to be the point upon which the contractor and dealer needs

most enlightenment. This fact is of course not new because those interested in the movement have been trying to hammer this thought home at every possible opportunity and it is practically impossible to pick up an electrical trade journal dealing with the affairs of the contractor and dealer without seeing an article on overhead expenses and their calculation. However, it is poor practice for the editor of these publications to state in the editorial columns or through other articles that not less than 25 per cent for overhead and 20 per cent for profit should be allowed on small jobs and then in the same issue or a later one allow articles containing reproductions of estimate sheets showing 10 per cent for overhead and 10 per cent for profit to be printed. The writer has noticed this in several instances. This is, of course, not good practice. It tends to lead the fellow who is inclined to study this question of overhead at first to believe that these amounts, say 25 and 20, as just mentioned, are theoretical values only and that they are not used in actual practice. This is a point which should be watched by those who may have occasion to write about this subject.

On the financial side of the business the principal difficulty seems to be that many contractors do not pay enough attention to their collections and, therefore, do not make the best possible use of their working capital. Part of the difficulty is due to the fact that before accepting a job some contractors never make any agreement as to how the payments shall be made and the payments are generally made at the pleasure of the other party. This condition of affairs will not obtain long if the contractor will submit his propositions on some contract form which specifically states just when and how the payments shall be made. Not only will this scheme make the collections easier but it has many other advantages. A form of contract especially adapted to the needs of the electrical contractor was outlined in the December fifteenth issue of the Journal of Electricity in this department.

Returning now to the question of advertising. Almost any business man will agree that advertising pays but they will not so generally agree upon what method is best. For the electrical contractor or dealer there seems to be little need for discussion on this point. Generally, he will secure satisfactory results by a systematic and careful distribution and use of the literature and sales helps which are furnished in most instances entirely without charge by the various electrical manufacturers or jobbers. If possible it is well to supplement this sort of advertising by newspaper advertisements using plates that will also be furnished by the manufacturer. Following out this scheme not only insures advertisements and literature of an excellent character but also enables the dealer to tie up his efforts with the national advertising. Every dealer should make the best possible use of such literature and follow the practice of not ordering it if he does not fully intend to use it. The cost of this literature has risen in leaps and bounds of late and unless it is handled without waste the time will come when either the manufacturer will be obliged to limit the supply or the dealer will be called upon to pay a portion of the cost of producing it. This is not a new thought because it has already been discussed by several of the large electrical manufacturers in co-

operation with the representatives of several large central stations who are also large users of such sales helps.

There is one thing certain; that is, there is a bright future ahead for the electrical industry in this country and the electrical dealer and contractor will become an important factor in the industry provided better business methods are followed and provided profits more commensurate with the risks taken are demanded. In the past few years much progress has been made but there is still more to be done in the future. Those who are interested in the affairs of the contractor will watch the progress of the various movements with much interest.

HEATING DEVICE COMPLAINTS

This is the season when there is very likely to be a great many complaints in connection with those types of electric devices which are used only for heating purposes. At the best the use of electric heaters in this country for heating rooms is practically limited to small bath rooms, ticket booths or for similar auxiliary service in the home or office. There is a tendency for the general public to overestimate just what a heater will do. In fact, this is the point which must be carefully watched in selling such devices; otherwise, the dealer is likely to have a lot of them returned for credit. Generally the difficulty is that the heater is entirely too small for the purpose, but in many instances it will be found also that the unsatisfactory results are due to low voltage.

It should be remembered that a certain amount of electrical energy will produce only a certain amount of heat. This is fixed and cannot be changed. However, the amount of heat which is utilized will depend entirely upon the design of the heating device and the conditions under which it is used. The fact that a luminous unit heater taking one kilowatt seems hotter than a non-luminous heater taking the same amount of energy does not mean that the luminous heater develops more heat. It simply directs the heat rays in a certain direction where more of them can be utilized. But the results of any type heater will not be satisfactory unless the voltage across the heater terminals is maintained at the proper value; in fact, the amount of heat developed falls off very rapidly as the voltage is decreased below normal. So in dealing with heater troubles, the voltage should first be checked and then the capacity of the heater noted to determine whether or not it should give proper results. In some instances the fact that the heater is too small will be so readily apparent that no attention need be paid to the question of voltage.

In a general way, the power required to keep an ordinary sized room at a comfortable temperature when the outside air is near freezing point is approximately 2 watts per cubic foot but this will vary considerably and more energy will be required if the outside temperature is lower.

The causes of low voltage are so well known that it is almost wasting time and space to mention them. Still, every once in a while a complaint is brought up and investigation shows this question was entirely overlooked. Most of the trouble comes from trying

to operate the heaters from a lighting circuit which is entirely too small in capacity. Even with the six hundred watt heaters which are operated through a lamp socket the results are likely to be poor due to the loss of voltage in the socket, cord and line if the distance from the meter is considerable. For larger heaters separate circuits should be provided and are required by the National Electrical Code.

The ideal condition is, of course, to have a separate circuit for the heating devices or similar appliances throughout the entire building with suitable outlets in every room. Not only will the voltage regulation be more satisfactory but the appliances can be more conveniently handled and will not in any way interfere with the lighting circuits. At the same time, such an arrangement will tend to popularize appliances, especially those types requiring more energy than socket devices. This point should not be overlooked by the electrical contractor. He should try at every opportunity to introduce these special circuits. The results will mean better service to his customers, a larger business for the central station and a better appliance business for himself.

THE FIELD FOR CONTROL DEVICES

One of the most important advantages of electricity as a means of transmitting energy is the ease with which electrical devices, apparatus or circuits can be controlled. Almost any conceivable scheme or sequence of operation can now be worked out with standard control apparatus, or slight modifications of it. Too often this matter is not given sufficient attention and there are numerous cases when a slight increase in the cost of installation would have allowed for proper control equipment. We do not have reference here to those forms of control devices which may be required by any particular electrical or safety code but rather to those which are optional with the purchaser. This is a field latent with possibilities and one which will warrant considerable attention from the electrical dealer and contractor.

Let us illustrate our point by an actual example. Not long ago a party who was building a new residence asked an electrical contractor for an estimate upon a stationary vacuum cleaning equipment. The bid was in due time submitted and the order for the cleaner and its installation secured. In going over the figures gotten up by the contractor, the writer noted that no provision had been made for the control of the cleaner, from distant points, although the house was to be of two stories. The contractor had figured upon supplying an ordinary knife switch with fuses to be placed near the cleaner in the basement. The matter of remote control was not considered or mentioned by the contractor simply because it was not brought up by his customer. The writer suggested that this installation could be greatly improved by adding a control station from which the cleaner could be started or stopped at each cleaner outlet. The suggestion was in turn passed on by the contractor to the owner who was indeed glad to have it brought to his attention. He immediately authorized the necessary switches and wiring as an extra to the original contract.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(The question of just when you are infringing on some one else's patent or when some one else is infringing on yours is here taken up. The importance of the claims made in the patent application can hardly be overestimated. It may be that you have a right to cover the whole field of appliances similar to yours, but unless you state your claim to that effect, the patent office will not suggest it to you, nor will the courts later recognize your right. The authors are prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Infringement

In the preceding issue, reference was made to the assumed invention of one Jones and to the two forms of claims respectively covering the same, to wit:

a. Generic Claim: In combination, a chair, and casters attached to the legs thereof.

b. Specific Claim: In combination, a chair, arms arranged above and at the sides of the seat thereof and casters attached to the legs thereof.

The relative values of broad, generic claims and of narrow, specific claims are due to the principles of law relating, respectively, to questions of infringement and of anticipation.

A claim calling for three elements is not infringed by the unlicensed manufacture or sale or use of a device containing only two of said elements.

A claim calling for three elements is infringed by the unlicensed manufacture or sale or use of a device containing said three elements plus one or more additional elements.

A claim calling for three elements is not anticipated by a prior device containing only two of said elements.

(Note: Like all general rules and statements, the foregoing are subject to exceptions, which cannot be set forth in such an elementary discussion as this.)

Jones' specific claim, calling for three elements, to wit: (1) a chair, (2) arms thereon, and (3) casters attached to the legs thereof, would not be infringed by a person, without license, making, or selling, or using a chair provided with arms but not with casters or provided with casters but not with arms. Such a chair would not embody the invention covered by such specific claim, because it lacks one of the three elements mentioned in the claim and by such mention therein, made an essential feature of the invention covered by the claim.

Jones' generic claim calling for only two elements, to wit: (1) a chair, and (2) casters attached to the legs thereof, would be infringed by a person, without license, making or selling or using a chair provided with casters but not with arms, because such claim does not call for "arms" or make "arms" an essential feature of the invention by mentioning arms as an element of the combination covered by the claim.

However, said generic claim, calling for two elements, would be infringed by a person, without license, making, selling or using a chair provided both with arms and casters because such chair would embody the two elements of the claim notwithstanding it also embodied, in addition, a third element, to wit: arms.

From the foregoing, it is apparent that the said

specific claim could not secure to Jones complete protection for his actual invention, because anyone, without infringing said claim calling for three elements, could make, sell and use chairs provided with casters even though they could not lawfully provide such chairs having casters with the third element of the claim, to wit: arms.

If Jones only claims the combination of casters with a chair provided with arms, he, in effect, dedicates to the public the right to combine casters with all types of chairs, other than chairs provided with arms, notwithstanding he was the first, in the art, to combine casters with any and all types of chairs, and, therefore, was entitled to a monopoly of such broad combination.

In view of the foregoing, it is seen that the more elements called for or specified in a claim, the narrower the claim becomes. A claim for two elements is broader than a claim specifying said two elements plus one or more additional elements. A claim by specifying or calling for twenty elements, makes every one of said elements an essential feature of the combination or invention covered by the claim. Nineteen of said elements can be used without infringing the claim.

(Note: Questions, relating to mechanical equivalents, to the substitution of equivalents, and to "mode of operation" are not taken account of in the foregoing remarks.)

Anticipation

If after the granting of a patent to Jones, it is discovered that a chair, without arms, but provided with casters, is described in a prior printed publication, Jones' generic claim would be anticipated by such prior disclosure and therefore void, because Jones could not be deemed the first inventor of a combination described in a publication published before he thought of making such combination.

However, such a prior publication would not anticipate Jones' specific claim calling for a third element, to wit: "arms," because no arms are referred to or described in such prior publication, and, therefore, the same does not show that Jones was not the first one in the art to apply casters to an arm chair. Therefore, the specific claim would not be invalidated by such prior publication.

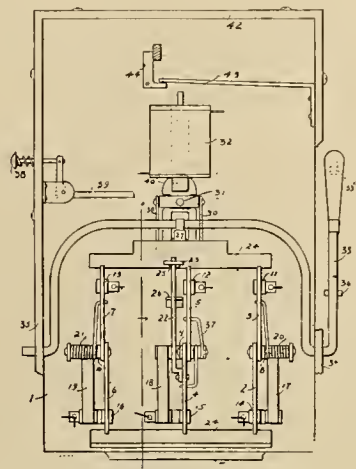
The foregoing illustrates the value of obtaining narrow, specific claims as well as broad, generic claims.

NEW IDEAS FROM THE WEST

Switch

Patent No. 1,247,751, issued to John A. Van Alstyne of Sacramento, California, discloses a novel form of knife switch. The switch is of the solenoid release type and is enclosed in a casing having a handle on the outside for closing the switch.

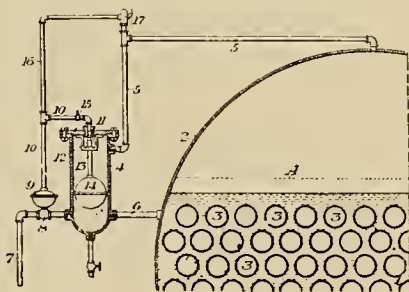
The switch consists of one or more switch blades, each blade consisting of two members hinged together and connected at their hinges to standards. Contact members are provided which are engaged by the outer ends of both members, the lower contact members being connected to the line and the upper contact members being connected to the motor. A fuse



connects each lower contact member with each central standard, so that when both members of a blade are in contact positions, the fuse is shunted and when the lower blade member is out of contact, the fuse will be in circuit. In starting the motor, both sides of the switch are closed and after the motor picks up its load, the lower blades are opened to place the fuses in series.

Safety Device for Boilers

Patent No. 1,247,244, issued to Daniel J. Duggan of Everett, Washington, shows a safety device for oil fired boilers which is controlled either by the level of the water in the

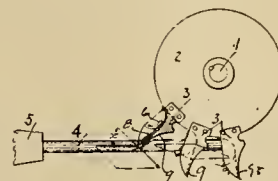


boiler or by the pressure within the boiler. A diaphragm valve is provided which controls the flow of steam to the burner controlling device. The valve is connected to the boiler through a pressure controlled valve, so that steam flows to the diaphragm valve when the pressure in the boiler passes a predetermined maximum. The diaphragm valve is also connected to the boiler through a float chamber in which water stands at the same level as the water in the boiler. A float in this chamber controls the flow of steam to the diaphragm valve and when the level of the water in the boiler reaches a predetermined minimum, the float descends and allows steam to flow to the diaphragm valve.

Water Wheel

Patent No. 1,247,830 issued to Charles W. Harris of Seattle, Washington, discloses a novel form of tangential water wheel bucket. The object of this invention is to prevent overspeeding of the wheel. This is accomplished by providing buckets having curved rear faces of such shape as

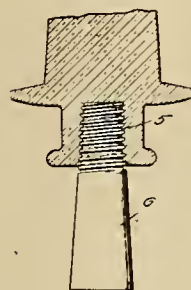
to wipe along the rear end of the intercepted portion of the water jet when the wheel is rotating at normal speed, and



to bear against the intercepted portion of the jet when the wheel is traveling at an excessive speed, whereby the speed of the wheel will be checked.

High Tension Fuse Plug

Patent No. 1,247,555 issued to Eugene H. Lowe of Modesto, California, shows a fuse plug of new construction. Difficulty is often experienced in removing high tension fuse plugs from the line on account of the arcing produced by



opening the circuit. Tools have therefore been provided for engaging the neck of the plug so that the lineman will be protected. The present invention obviates the necessity of any special tool by forming in the plug a socket internally threaded to match the threaded end of an ordinary insulator pin, which may be used to place or remove the plug.

Oil Engine

Patent No. 1,247,904 issued to James M. Thorp of Alameda, California, discloses a novel process of gasifying fuel for use in oil engines. In this process the fuel is injected into a retort, a part of the products of combustion from a prior



explosion in the engine cylinder are admitted into one end of the retort, then the other end of the retort is opened and some of the gasified contents of the retort are allowed to enter the engine cylinder during compression of the air therein, whereby an explosive charge is produced.

The patent calls for a retort in the cylinder head, consisting of a long passage or conduit with valved ends communicating with the engine cylinder, means for opening and closing one end of said passage during the power stroke of the engine, means for injecting fuel into the retort, and means for opening and closing the other end of the retort during the compression stroke, for the purpose specified.

SPARKS—Current Facts, Figures and Fancy

(The application of true economy, not by giving things up, but rather by doing them in a better way, is the very gospel of electricity. Just as the new lamps actually represent a saving of electricity over the old carbon-filament lamps, so electrical methods in the household, from vacuum cleaners to washing machines, will come to be looked upon not as a luxury, but as an economy.—The Editor.)

The quality of conducting electricity which a stream of water possesses to high degree has led to injury to firemen when water from a hose falls on charged wires. A new extinguisher uses a liquid which will not permit the passage of electricity.

* * *

In a large Norwegian hydro-electric power station heat from the generators is used for various warming purposes. These generators are entirely cased in and fitted with cooling apparatus to keep down temperature, the rotor being fitted with ventilation fans, which drive the hot air into a system of ducts, distributing it through the power station for heating purposes.

* * *

A novel method of hastening the unloading of tank cars of oil in winter is to heat the oil by an electric heater, which makes it flow more freely, releases the car sooner, saves demurrage charges, and is free from fire risk. The electric heater used for this purpose is one known as the immersion type, and has been used also for accelerating the handling of coconut oil in barrels and tanks.

* * *

By the use of selenium cells a device has been worked out by which ordinary print can be translated into sound, thus enabling the blind, as it were, to see with their ears. The recent developments have made it unnecessary to use transparencies for this purpose, black print on white paper very brightly illumined being sufficient to modify the light source and produce a modification of the sound.

* * *

In order to facilitate the construction work actually necessary for war enterprises, England is further restricting building for other purposes. At present no building work costing more than £500 may be proceeded with without special permission from the government. The regulation is to be carried further. The new rule will prohibit "any form of constructional or decorative work, with few exceptions, without express permission."

* * *

As an evidence of the growing industrial activities of the West, leading to greater and ever greater consumption of electricity, it is interesting to note the growth of war industries which are not always powder manufacture or shipbuilding enterprises. According to information received by the Bureau of Fisheries, Department of Commerce, a whaling company on the Pacific Coast is planning to erect two canneries to be operated next season, each with a capacity of 30,000 cases.

The implement dealer and the dealer in electrical apparatus for the farm can do much to help increase farm production by encouraging a desirable class of tenants and owners on farms. If the community has good roads, schools, churches and community spirit, it will have good owners and tenants on its farms. There is a distinct opportunity here for the implement dealer to be a leader in community development, and also to overcome the isolation and drudgery of farm work by persuading people to install modern water, lighting, laundry, and power equipment as an aid to the women as well as the men, and to also give relief from labor shortage.

* * *

A portable electric lamp cooking box is described by an ingenious householder. A 16 candlepower lamp is used in a completely insulated box in which the cooking utensils are very nearly a fit, the air space being small. In a pocket in the heat-insulating material there is a thermal strip which, when the temperature reaches a predetermined figure, cuts off the lamp on the thermo-blink principle, maintaining the temperature a little below boiling point. This prevents anything in the cooker from boiling over. In addition to this, there is an alarm clock arranged with a contact which is closed by the alarm.

* * *

A recent bulletin published in the interests of war conservation, points out that a wide margin exists for the reduction of household consumption of electricity, in furtherance of fuel and freight saving. For instance, despite the remarkable development of cheap, metallic-filament incandescent lamps during the past few years, there has been no reduction whatever—in fact, an increase, rather—in the use of old-fashioned carbon-filament lamps, which the modern lamps should have displaced. It would pay every consumer of electricity many times over to purchase modern lamps and economize by reductions in electric-current bills.

* * *

On the Speaker's desk in the House of Representatives is a little clock-like machine, with a dial graduated in minutes from one to six and a single hand that goes once around the dial in six minutes. This is started and stopped by moving a tiny lever at the top. The speaker uses it in timing members in a debate when the speeches are limited. The inventor designed it for keeping time on long distance telephone calls, which are limited to three minutes. It is calculated that of the \$116,000,000 spent annually for long-distance calls \$62,000,000 is wasted, for in the average call only 1½ minutes are used, while three minutes are paid for.

PERSONALS

J. G. Scrugham, formerly professor of mechanical engineering at the University of Nevada, and more recently state

engineer of that commonwealth, is now major in the Ordnance Department of the United States Army, with headquarters at Washington, D. C. Mr. Scrugham has under his personal supervision at the national capital contracts that aggregate some ninety million dollars in valuation. In his service to the nation in extensive responsibilities as this, the West takes pride in noting his activities and readers of the Journal of Electricity

will be interested in following, from time to time, the progress of his labors.

Olaf Ussing has recently been elected president of the Yolo Water & Power Company, to succeed W. G. De Celle.

E. B. Craft, **E. H. Colpetto** and **W. F. Hendry** have recently been appointed assistant chief engineers of the Western Electric Company.

H. Frank Marble, formerly county engineer of Yakima county, Washington, has been appointed Commissioner of Public Works of North Yakima, Wash.

R. E. Frickey, western representative of the Thordarson Electric and Manufacturing Company at San Francisco, has left for Chicago for a two-month visit.

Norton L. Taylor of Tacoma, Wash., has been appointed special engineer to make surveys and estimates on increasing the storage of the Nisqually basin of the power plant.

Emerson Hoar, chief electrical engineer of the California Railroad Commission, has resigned to accept a commission as captain of engineers in the United States Reserves.

Major Edwin A. Taylor, of the Engineer Corps, U. S. R., chief engineer of the Denver Union Water Company, left Denver, Colo., recently for Camp Lee, Petersburg, Va.

T. W. Simpson, western manager of the Federal Sign System (Electric), has spent several days during the early part of January through the San Joaquin Valley, California.

C. G. A. Baker of Baker-Joslyn Company, has returned from an extended Eastern trip, during which he visited the various manufacturers represented on the Pacific Coast by his company.

A. G. Kimball, vice-president, and **F. J. Wachter**, cutlery sales manager of Landers, Frary & Clark, are making a trip through various cities of the Pacific Coast, visiting their branch offices.

Paul V. Quick, who has been associated with Landers, Frary & Clark for several years, has been given charge of their electrical department on the Pacific Coast, with headquarters at San Francisco.

A. E. Garland of Garland & Affolter, manufacturers' representatives, has returned to San Francisco from the Pacific northwest. The firm has opened an office in the L. C. Smith Bldg., Seattle, in charge of **H. H. Thedinga**.

Ed. Woodbury, formerly of the Pacific Light & Power Corporation, is now located at Philadelphia, where he has taken a position as assistant electrical engineer with the American International Ship Building Corporation.

Frederick W. Johnson of the Puget Sound Traction, Light & Power Company, has been made assistant to **E. C. Macy** in charge of construction work for Stone & Webster in the Northwest, and will have his headquarters at Seattle.

M. P. Groftholdt, who has been superintendent of the eastern division of the Pacific Electric Railway, of Los Angeles, Cal., has been appointed general traffic inspector of the entire system, reporting to **Mr. J. McMillan**, general manager.

J. J. Portley, recently connected with the selling force of the Western Electric Company, Minneapolis, Minn., and also previously representing the company on the Pacific Coast and in Chicago, is now in charge of the appliance department at New York City.

Prof. E. A. Lowe of the University of Washington, Seattle, Wash., is on a year's leave of absence and is employed by the American Nitrogen Products Company as electrical engineer. No substitute has been appointed as the decrease in enrollment made this unnecessary.

F. B. Mitchell, of Landers, Frary & Clark, has just completed an interesting lecturing tour in the Northwest, and has passed through San Francisco to Los Angeles and the Southwest. In his tour he is explaining to the distributors of Universal ware, the uses and abuses of this type of appliance.

B. F. Cox, director of the John S. Metcalf Co., Ltd., of Melbourne, Australia, manufacturers and installers of electrically operated grain elevators for the Australian government, is making a tour of the United States and recently passed through San Francisco and Los Angeles on his way East.

J. B. Myers, who has been Tintic manager for the Utah Power & Light Company, of Salt Lake City, ever since the corporation took over the business and property of the Telluride and Knight companies in the Eureka district some years ago, has been given the management of the Bingham Canyon Division.

A. E. B. Hill, for ten years with the British Columbia Electric Railway Company, Ltd., of Vancouver, B. C., retired recently. Members of the staff united in presenting him with a solid silver loving cup, the presentation being made by General Manager George Kidd, who voiced the esteem of the officials and employees of the company.

Max Thelen has been reappointed to the position of chairman of the California State Railroad Commission. In view of the important problems in public utility rate fixing and valuation which are now before the commission, it is of considerable interest to electrical men in California to know that its conduct is to be in familiar hands.

Goeffrey Porter has resigned as chief electrical engineer of the British Columbia Electric Railway Company, Ltd., of Vancouver, B. C. Mr. Porter intends to take up private practice as advising and contracting engineer, but in the meantime will visit Japan. The company does not intend to appoint a successor to Mr. Porter at the present.

Nand Singh Sihra, formerly a Hindu student in mechanical engineering at the University of California, is now

with the International Harvester Corporation at Milwaukee, engaged in the manufacture of agricultural motor appliances. Since attending the California institution some three years ago, Mr. Sihra has traveled extensively over many parts of the civilized world, and it will be interesting to follow his agricultural and engineering progress upon his final return to India, where an ever-increasing interest is being shown in things mechanical and electrical as developed in the United States.



J. H. Pardee, president, and J. P. Ripley, railway engineer, The J. G. White Management Corporation, New York City, are on their way back to New York after visiting the Philippine Islands, making a general inspection of the Manila Electric Railroad and Light Co., and other interests in the Islands operated by the Management Corporation.

J. D. A. Cross, who has charge of General Electric Company's Heating Device Sales, and C. P. Randolph, engineer in charge of the General Electric Heating Device Production at Pittsfield, are included in the transfer to the new company with the recent amalgamation of Hotpoint Company with the Hughes and General Electric Heating Device interests.

Frank G. Baum, consulting engineer of San Francisco, had charge of the engineering and construction of a hydro-electric plant for the Cerro de Pasco Mining Company in Peru, and another for the Homestake Mining Company at Spearfish, South Dakota, and has under way a 1000 horsepower hydro-electric plant for the San Luis Mining Co., of Mexico.

W. R. Thompson, formerly captain of the 109th Regiment of Engineers, stationed at Camp Cody, Deming, New Mexico, has been made major in the same regiment. In civil life Major Thompson was manager of engineering and construction for H. M. Bylesby & Co., and won recognition for valuable work in construction and engineering performed at and near Camp Cody.

Dr. Washington Dodge, vice-president of the Anglo and London-Paris National Bank, has been elected president of the Federal Telegraph Company, which is the operating company for the Poulsen Wireless Corporation. It is understood that in accepting this position he will resign his connection with the bank and devote his entire attention to the development and expansion of wireless interests.

A. R. Thompson, of the distribution department of the Pacific Gas and Electric Company, has resigned to accept a commission as captain of engineers in the United States Reserves. S. J. Lisberger, of the distribution department of the Pacific Gas and Electric Company, will in future have direct charge of Mr. Thompson's former duties, and will act as chief engineer of the San Francisco district in both steam and electric work.

George E. Erb, of Lewiston, Idaho, has been appointed to the Public Utilities Commission of that state by Governor Alexander. Mr. Erb succeeds Mr. Alex P. Ramstedt, who resigned almost a year ago to take a position as controller with the Day mining interests. Mr. Ramstedt was president of the commission and his term had expired. Mr. John W. Graham, of Twin Falls, succeeded him as president of the commission.

Arthur B. Smith, district engineer with the Los Angeles county Road Department, has been commissioned as lieutenant in the Engineers' Corps., and has been assigned to the Engineers' Officers' Training School at Camp Lee, Petersburg, Va. With a Christmas banquet the twenty road construction and maintenance foremen of District No. 1 wished him god-speed and presented him with a pair of prism binoculars as a practical expression of their esteem.

Melville Dozier, Jr., of San Francisco, formerly assistant general manager of the Northern Electric Railway, has recently been appointed general manager of the State Reclamation Board. The position was created by the legislature at the session of 1915, but has remained vacant until now. As the reclamation projects under way at the present time involve an outlay of from thirty to forty million dollars, the

position is one of considerable responsibility and importance.

Guy A. Richardson, superintendent of railway, Puget Sound Traction, Light & Power Company, Seattle, has been called to Philadelphia by the International Mercantile Corporation to assist for a time in solving the problems of transportation to and from its plant at that place, where thousands of men are employed in constructing steel ships for the United States. Charles A. Stone of the Stone & Webster Managers, is president of the International Mercantile Corporation.

Thomas W. Younger, retired superintendent of motive power of the Southern Pacific Company, at Portland, was recently tendered an informal banquet by more than one hundred of his friends and associates. Mr. Younger retired from the service of the company in February, 1917, after forty-five years' continuous service, having risen from apprentice in the car shops at Sacramento to superintendent of motive power.

Charles Wellman Parks, the well-known engineer, has been named by the President to be Chief of Bureau of Yards and Docks, Navy Department, to succeed Rear Admiral Frederick R. Harris, who resigned several weeks ago, when he became general manager of the Fleet Corporation. Civil Engineer Parks is now public works officer at the naval station at Honolulu, Hawaii, which position he has held since January, 1915, and has had charge of the building of the dry dock at Pearl Harbor and other important works.

Frank W. Hall has been appointed commercial manager of the Sprague Electric Works of the General Electric Company. With the exception of a short period, Mr. Hall has been connected with the Sprague Works continuously for twenty-two years in various engineering and sales capacities, and for the three years prior to his present appointment occupied the position of sales manager. D. C. Durland, former executive head of the Sprague Electric Works, has resigned to accept the presidency of the Mitchell Motors Company, Inc.

A. S. Lindstrom, who is now general manager of the Thordarson Electric Manufacturing Company of Chicago, which has recently undergone a reorganization in all departments, is quite well known in the industry through his connection with the St. Louis and San Francisco World's Fairs. Mr. Lindstrom was assistant chief and director of high-voltage research work in the Machinery Palace at the San Francisco fair. After the fair he became western representative for the Thordarson Electric Manufacturing Company, which position he held until he came to Chicago to take up his present work.

OBITUARY

Henry L. Herrick, consulting engineer of the Montana Power Company, died recently in Butte, Montana. He was one of the most widely known hydraulic engineers in the country, and was a member of the firm of Charles T. Main & Co., Boston. The deceased resided at Great Falls, Montana, for a number of years and was consulting engineer on construction of the Thompson Falls dam at Thompson Falls, the Holter dam at Wolf Creek, Hebgen dam at Madison, the lower Madison dam and all of the engineering design work of the Montana Power Company. He was 61 years old and death is thought to have been caused by the high altitude. He is survived by his wife, two daughters, and a son.

THE SUBSCRIPTION CONTEST: On another page of this issue detail standings are shown of the various contestants for the subscription contest of the Journal of Electricity. This contest closes January 31, 1918, and at that time the award of an automobile, a graphophone and many other prizes, including a \$50 Liberty Bond, will be made. Now is the time for every sincere believer in the good work of the Journal of Electricity to put endorsement into concrete action. This last appeal is made to you as a consequence to urge, if you are not now a personal individual subscriber, that you become so at once, and urge your associates to become individual subscribers. Turn to page four of the advertising section and find the name of the contestant you wish to support, and send in your subscription by return mail. The Journal's cause is a worthy one and it merits your support.

MEETING NOTICES FOR ELECTRICAL MEN

(The coming convention of the Pacific Coast Supply Jobbers Association, scheduled for Del Monte on January 24th, is perhaps the most important event on the electrical man's horizon so far as gatherings are concerned. A recent session of the Commercial Committee of the Pacific Coast N. E. L. A. in Los Angeles, at which important plans were made for an extensive educational merchandising campaign, and several interesting local meetings mark the two weeks period just past.—The Editor.)

Convention of Pacific Coast Electrical Supply Jobbers

Place: Del Monte.

Time: January 24, 25, 26, 1918.

Invitations have been issued for the next meeting of the Electrical Supply Jobbers Association of the Pacific Coast at the place and time above specified. Members are asked to advise the secretary if they will go, so that reservations can be made. This will be the annual meeting, with election of officers and other business of interest. Thursday night, January 24th, will be devoted to a consideration of the report of the Committee on Credit Problems. Everyone is supposed to come prepared to get valuable information, and perhaps golf cups.

Commercial Committee, Pacific Coast Section, N. E. L. A.

An important meeting of this committee was held at the Jonathan Club, Los Angeles, on January 3rd, with the following members in attendance: Chairman R. M. Alvord, Lee H. Newbert, E. B. Criddle, A. E. Holloway, H. J. Kister, G. B. McLean, M. L. Scobey, E. B. Walthall and Secretary A. H. Halloran. A number of other electrical men of Los Angeles were present by invitation.

Three papers were selected for presentation by the committee at the annual convention at Del Monte, April 24-27, in addition to two papers prepared by a committee of electrical jobbers and a committee of contractor-dealers. The first two will be presented for discussion and the third for publication only. These papers and their authors are as follows:

"Retail Selling Practice," L. H. Newbert, H. L. Allen, M. L. Scobey, E. B. Criddle, H. A. Lemmon.

"Bricks Without Straw" (Business Without Expense), G. B. McLean, H. J. Kister, C. M. Einhart, W. S. Berry, M. F. Steel.

"Industrial Electric Heating," A. E. Holloway, J. B. Black, E. B. Walthall.

The next meeting will be held at Fresno on March 1st.

San Francisco Electric Development and Jovian League

The privileges of the San Francisco Development League luncheon were extended to the wives and women friends of members at the Ladies' Day meeting, held January 9th at the Palace Hotel. The following distinguished women were guests of honor: Dr. Aurelia H. Reinhardt, President of Mills College; Mrs. Emrich, Lecturer on Armenia; Mrs. May L. Cheney, Appointment Secretary, University of California, and Mrs. Robert S. Burdette of the Federal Food Conservation Board. Mrs. H. F. Jackson, wife of the President of the Pacific Coast Section, N. E. L. A., acted as honorary chairman of the day.

Dr. Reinhardt later addressed the meeting on the present position of women in the changing order of things. As an educator of young women, she pointed out the necessity for modifying the educational system to turn out the modified product in young women desired and urged an open-minded attitude on the part of electrical men toward the entrance of women in their industry. She further pointed out the present danger of women breaking off an educational preparation to take up war positions. The man or the woman who has perspective enough to judge relationships and to get on with the world can go farther than the one who has merely the technical knowledge.

Mrs. Emrich then gave a stirring picture of present conditions in Armenia. The meeting offered a pleasant opportunity for the wives and families of members to become mutually acquainted and will prove a stepping stone to a successful social side to the spring convention of the N. E. L. A., which is to be held in April at Del Monte.

San Francisco Advertising Club

Electrical men concerned in advertising their products are interested in the coming convention of Advertising Clubs. Officers and members of the Executive Committee of the Associated Advertising Clubs of the World will arrive in San Francisco, Monday, January 14th. Their visit here at this time is for the purpose of conferring with the officers and directors of the San Francisco Ad Club regarding the convention that is to be held here next July of the affiliated advertising clubs of the country.

On Tuesday evening, January 15th, the San Francisco Ad Club will tender the visiting officials a banquet at the Hotel St. Francis.

Oregon Section of the American Chemical Society

The Fortieth Meeting of the Oregon Section of the American Chemical Society was held in Portland on Friday evening, December 28th. The subject for the evening was "Science of the War." Prof. E. E. DeCou, of Eugene, spoke on Mathematics; Prof. A. A. Knowlton, of Reed College, on Physics; Prof. W. C. Morgan, of Reed College, on Chemistry; and Prof. H. B. Torrey, of Reed College, on Biology.

The 336th A. I. E. E. Meeting in Boston, New York and Chicago

The 336th meeting of the American Institute of Electrical Engineers was an Inter-Sectional meeting held in Boston, January 8th; New York, January 11th, and Chicago, January 14th, 1918. The same paper was presented and discussed at the three places. The subject was "Effects of War Conditions on the Cost and Quality of Electric Service," by Lynn

BUILDERS OF THE WEST—XXI



JOHN MARTIN

To John Martin, a man of exceptional constructive imagination, the West must ever be indebted. He it was who had the broad vision to see the possibility of hydro-electric development in the high Sierras and its practical uses in industrial centers hundreds of miles distant. This issue is, as a consequence, dedicated to Mr. Martin as a testimonial for future historians to note in recording the accomplishments of hydro-electric development in the West.



THE SCENE OF THE COMING N. E. L. A. CONVENTION

The center picture gives a glimpse of the hotel across the lake. On the right and left views along the famous Monterey coast line are shown.

S. Goodman and William B. Jackson, and was given under the auspices of the Committee on Economics of Electric Service. It was presented at the Boston and New York meetings by Mr. Goodman and at the Chicago meeting by Mr. Jackson.

The Del Monte Convention

Arrangements for the papers to be presented at the forthcoming convention of the Pacific Coast Section, N. E. L. A., are now well in hand. The commercial section, under the able leadership of L. H. Newbert, is preparing a series of helpful papers for discussion, while the engineering section, under J. E. Woodbridge, who last year arranged papers of now widely recognized usefulness, is again gathering data for even greater effort.

The convention committee, under the chairmanship of Robert Sibley, editor of the Journal of Electricity, is already planning the transportation, hotel features, and general conduct of the convention. The other members of the convention committee are:

- W. W. Briggs, Great Western Power Co.
- W. L. Frost, Southern California Edison Co.
- E. R. Northmore, Los Angeles Gas and Electric Corporation.
- H. H. Jones, San Diego Consolidated Gas and Electric Co.
- A. B. West, Southern Sierras Power Co.
- H. P. Pitts, Pacific Gas and Electric Co.
- R. E. Fisher, Pacific Gas and Electric Co.
- T. E. Bibbins, Pacific States Electric Co.
- W. S. Berry, Western Electric Co.
- R. F. Behan, Westinghouse Electric and Manufacturing Co.
- H. C. Reid, California Association of Electrical Contractors and Dealers.
- J. W. Redpath, California Association of Electrical Contractors and Dealers.
- M. A. DeLew, California Association of Electrical Contractors and Dealers.
- W. M. Deming, Journal of Electricity.

Pacific Coast Gas Association

The 1918 Board of Directors of the Pacific Coast Gas Association held their first meeting on December 17th for the purpose of outlining the association's activities for the coming year, at which meeting the following committees were appointed:

Wrinkle Department—W. M. Henderson, Editor, Pacific Gas & Electric Co., San Francisco, Cal.; Experience Department—John Clements, Editor, Pacific Gas & Electric Co., Oakland, Cal.; Publicity Department—F. S. Myrtle, Editor, Pacific Gas & Electric Co., San Francisco, Cal.; Library—E. C. Jones, Librarian; J. P. Baloun, Assistant Librarian, Pacific Gas & Electric Co., San Francisco, Cal.; Gas Engineering Degree Committee—John A. Britton, Chairman, Pacific Gas & Electric Co., San Francisco, Cal.; Gas Exhibits

Committee—B. S. Pedersen, Chairman, George M. Clark & Co., Division of San Francisco, Cal.; Membership Committee—A. B. Day, Chairman, Los Angeles Gas & Electric Corporation, Los Angeles, Cal.; Legislation and Taxation Committee—F. S. Wade, Chairman, Southern Counties Gas Co., Los Angeles, Cal.; Public Policy Committee—W. B. Cline, Chairman, Los Angeles Gas & Electric Corporation, Los Angeles, Cal.; Committee of Piping of Buildings for Gas—George P. Egleston, Chairman, Coast Counties Gas & Electric Co., San Francisco, Cal.; Committee on Papers and Meetings—L. B. Jones, Chairman, Pacific Gas & Electric Co., San Francisco, Cal.; Entertainment and Reception Committee—Van E. Britton, Chairman, Pacific Gas & Electric Co., San Francisco, Cal.; Committee on Technical Information—E. C. Jones, Chairman, Pacific Gas & Electric Co., San Francisco, Cal.

Bankers Committee to Consider Security Issues

Warren S. Hayden of Cleveland, President of The Investment Bankers' Association of America, has appointed a special committee to investigate and consider the question of conservation of capital in its relation to the prosecution of the war. The committee consists of: Allen B. Forbes, Chairman, Harris, Forbes & Co., New York; N. Penrose Hallowell, Lee, Higginson & Co., Boston; H. C. McEldowney, President, Union Trust Company, Pittsburgh; H. L. Stuart, Halsey, Stuart & Co., Chicago; W. R. Compton, W. R. Compton Co., St. Louis.

Sugar Engineers' Convention

Robert E. Hughes, at the sugar mill engineers' convention held recently at Honolulu, H. I., presented a paper on the use of electricity in place of steam for drive in all new installations. He was very much in favor of electrification of sugar mills, and while no comparative figures as contrasted with steam drive were presented, he unqualifiedly stated that electricity was the more efficient. Mr. Hughes' remarks on this subject were in part as follows: "With the extension of the use of electricity for motive power in sugar factories, we have sufficient proof that its many advantages are very generally recognized. The application of electricity to all forms of power application has long since passed the experimental stage. The larger the scale on which electric power is generated the greater the economy. Cane-sugar factory operation and general mill practice have been improved as the result of the application of the electric motor drive to the many pumps and line shafts in the factories, and almost without exception have been attended by the following results: Increased production, decreased operating expenses, decreased maintenance charges, greater ease of operation and increased reliability. There are now some twenty or more sugar mills in the world completely electrified, and in every one the change to electric drive resulted immediately in better steam economy, lower maintenance and labor cost and greater reliability of service."

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m. followed by regular meeting.
January meeting—Jan. 19th—"The Manufacture of Military Explosives."

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.
Next meeting—January 25.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th Street, Boulder, Colo.
Secretary—William N. Gittings, 2429—12th Street, Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Cornwallis, Oregon.
Secretary—L. Happold, Oregon Agr. College, Cornwallis, Oregon.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.

Meetings—Third Friday of every month of the school year in the Electrical Bldg. Next meeting—Jan. 18, 1918.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stiles, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

President—Col. Robley Stearnes, New Orleans, La.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—E. E. Brown, 245 Minna St., San Francisco.
Secretary—C. L. Chamblin, 641 Mission St., San Francisco.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Nevada Ass'n of Electrical Contractors and Dealers

President—R. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electric Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.

Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Next Meeting—Del Monte, January 24th.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson—Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 502 Flatiron Bldg., San Francisco.
Meetings—Annually—San Francisco—May.

OF GENERAL ELECTRICAL INTEREST

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually in April.
Next meeting—Del Monte, April 24-27, 1918.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next Convention will convene in Portland, September 11, 1918.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N.M.
Secretary—E. M. Haggerson, Silver City, N.M.
Meetings—Annual, in February.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday of each month.
President—G. H. Stickney
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

San Francisco Electrical Development and Jovian League

President—Robert Sibley, Crossley Bldg., San Francisco.
Secretary—J. D. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m. luncheon, Palace Hotel.
Next meeting—January 16.

Los Angeles Jovian Electric League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m., Jahnke's Tavern, 524 S. Spring Street.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
 Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
 Meetings—Quarterly.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—H. L. Vorse, Box 973, Portland, Ore.
 Secretary—Orrin E. Stanley, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—E. B. Hussey, Alaska Bldg., Seattle, Wash.

Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. Buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.

President—B. P. Legare, 58 Sutter St., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.

MISCELLANEOUS**Foreign Trade Club**

President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening, January 9—Hon. Henrik Axelsson spoke on "Sweden and San Francisco After the War."

American Ass'n for the Advancement of Science—Pacific Division

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.

Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.

Meetings—Annual. Next meeting—March 28-30, 1918, Throop College of Technology, Pasadena, Cal.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.

Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

December Meeting—December 28 in Room F of the Public Library. Speakers: Prof. E. E. DeCou of Eugene, Ore.; Profs. A. A. Knowlton, W. C. Morgan, H. B. Torrey, of Reed College.

HAPPENINGS IN THE INDUSTRY

Changes and Beginnings

The General Gas-Electric Plant Co. of Fargo, N. D., has been incorporated by Fred Schulze and A. L. Costello of Bismarck, N. D., and Herman Rabe and George Berzey of Dickinson, N. D. The paid capital is given as \$25,000. The company is to engage in the manufacture and installation of gas plants and is to sell gas and electricity, according to the report of the incorporation.

The Western Electric Mechanical Company has been incorporated by Walter J. Burpee, W. H. Ellison and George J. Helm to deal in and manufacture electrical appliances at 465 Second street.

The Quincy Light & Power Company of Quincy, Cal., has changed ownership in part. The plant was formerly owned by Mrs. O. P. Payne and H. C. Flournoy. Flournoy's share in the company has now been purchased by O. P. Payne. No change has been announced in the service.

The plan of reorganization of the Petaluma and Santa Rosa Railway Company, having been worked out by the committee in charge, has been submitted to holders of the corporation's securities with the suggestion that they take prompt action. The proposed plan of reorganization contemplates the organization of a new company with a capitalization of \$1,000,000 in common stock, \$250,000 in 6 per cent cumulative preferred stock and \$750,000 25-year 5½ per cent bonds.

The Standard Electric Company, Herbert C. Moss, proprietor, has moved from 316 First avenue South, Seattle, to 73 Horton street, where a new shop and office building has been constructed for its special use. This step became necessary on account of large increase in business. The company was organized on December 15, 1917, and has increased to the extent that 15 to 20 men are employed continually. It specializes on power work, industrial lighting and marine installation. Some of the important jobs were: Installing entire electrical equipment in the Sandstrom shipyard north of Ballard and in the new yards of the McAteer Shipbuilding Company at South Park; a two and one-half ton electric furnace for the Rother-Process Steel Company, South Park; entire electrical equipment in the plant of the National Engineering & Equipment Company at South Park; several cranes and light and power wiring for the Puget Sound Machinery Company and is installing a three-ton electric furnace for the Olympic Steel Works.

A. H. Cox & Co., 307 First avenue South, Seattle, report much activity in their lines of work. They are installing a 650 horsepower pumping station at Prineville, Oregon, for Twohy Brothers of Portland, having large contracts in that section. A plant similar to this is being installed at Bremer-

ton for the Puget Sound Bridge & Dredging Company of Seattle. The company is installing all of the electrical equipment in the plant of the Seattle Can Company to the extent of 250 horsepower, the motors ranging from 3 to 50 horsepower. Machines are all individual drive supplied with constant speed three-phase 440-volt motors with overload and no-voltage releases.

The change of name from the McFell to the Watts Electric Company of 133 Fourth street, San Francisco, as announced in the January 1st issue of the Journal of Electricity, marks also the entry of the firm into the retail merchandising field. This departure of the Watts Electric Company is indicative of the growing tendency of the modern electric contractor to give more earnest practical attention to the retail side of the industry and retain to himself the opportunity for added sales created by the construction end of the business.

Moloney Electric Co. of St. Louis, Mo., have opened district offices at 2005 L. C. Smith Bldg., Seattle Wash.

Offices have been established at Seattle, Wash., by the Electrical Engineers Equipment Co. of Chicago in the L. C. Smith Bldg.

The Northwest Electric and Water Works of Seattle and Tenino, Wash., has been succeeded by the Washington Coast Utilities.

The Sierra and San Francisco Power Company's Copperopolis substation, which supplies a portion of the mining district of Tuolumne County, was destroyed by fire on the afternoon of the Nov. 13th, with an approximate loss of \$10,000.

New Power Loads

The Richmond Chemical Company has completed installation of machinery at Richmond, Cal., and expects to be ready for operation about the first of the year. This company will be served by the Western States Gas & Electric Company to the extent of 50 horsepower in motors. The Atlas Powder Company has purchased 206 acres of additional land, and it is expected that enlargements to their present plant will soon be made.

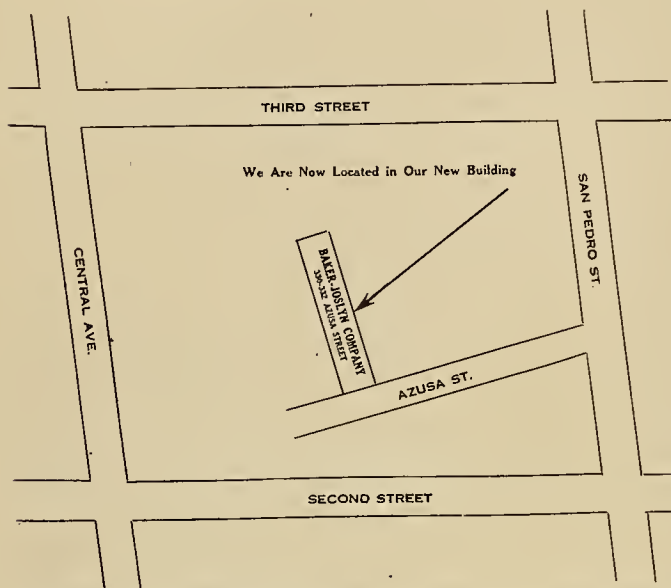
Recent additions have increased the power requirements of the Cascade Contract Company at Shedd, Ore., to 385 horsepower in motors, the original contract calling for 250 horsepower.

The Astoria Pulp & Paper Company has contracted for an additional 50 horsepower from the Pacific Power & Light Company, which will later be increased by approximately 55 more. One small gasoline engine was replaced by an electric motor, and a steam engine in a boat shop has been replaced with a 5 horsepower motor.

There was placed in service in December for the Cerro de Pasco Mining Company, Peru, a 3000 kw. hydro-electric plant. The company already had one plant of 9000 kw.

Baker-Joslyn Company in New Quarters

On January 1st the Los Angeles branch of the Baker-Joslyn Company moved into its new building at 330-332 Azusa street. The building is of all brick construction, with modern warehousing and shipping facilities. It will be occupied entirely by the Baker-Joslyn Company, and is built to permit



This map of the new location was sent to patrons of the company in place of a letter.

of additional stories as required. There is also a spur track, which permits of unloading and loading cars directly to and from the warehouse. The offices are modernly equipped and pleasantly arranged.

The rapidly growing business of this company necessitated a change from the old quarters and it was deemed wise to provide against future growth in the manner indicated.

The success of the energetic and at the same time fair policy pursued by this company is evidenced by this progress.

"Ted" Burger is manager of the Los Angeles branch of the Baker-Joslyn Company.

Arizona Steam Plant Tests

An official test of the new steam plant of the Arizona Steam Generating Company (a subsidiary of the Arizona Power Co.) of Prescott, Ariz., has just been completed. The plant was designed and installed by Charles C. Moore & Co. of San Francisco. The full load capacity of the plant at normal is 5000 kw. with 6000 kw. turbine.

A test run of 46¾ hours at 5000 kw. was followed by 6 hours at 6000 kw. The average was 240 lbs. steam, 150 degrees superheat and 60° F. temperature condensing water, power factor .90 (generator efficiency not corrected). California crude oil from Bakersfield (42 gallons per barrel) was used as fuel. (No corrections were made for fuel conditions).

The results showed:

Actual weight of fuel used, 270,065 pounds; actual kwh, gross generated by turbine, 269,832 kwh.; 1 per cent of kwh, used on plant auxiliaries and camp power and lights, pumping, circulating water, etc.

The result, in other words, indicated that on the basis of 140 barrels of oil weighing, 340 lbs. per barrel, the gross generated was 340 kwh. per barrel. The net to transformers to be transmitted to 45,000 v. lines was 336.6 kwh. per barrel.

Credit is due to most excellent engineering work of C. R. Weymouth and his corps of efficient assistants.

Contract Awarded

In the contract awarded some time ago by the Chicago, Milwaukee & St. Paul Railway Company for engines, sub-stations and other equipment to be used on its line which is being electrified between Othello, Wash., and Seattle and Tacoma, a distance of 216 9-10 miles, contract for ten of the locomotives and three of the sub-stations was awarded to the Westinghouse Electric & Manufacturing Company and contract for seven of the locomotives and five of the sub-stations awarded to the General Electric Company. The Westinghouse Company was awarded the contract for the power limiting equipment in all of the sub-stations. Weight of Westinghouse locomotives is 266 tons each, and they are equipped with 12 motors and regenerative control. Each has capacity to haul a 960-ton trailing load at 25 miles per hour on a 2 2-10 per cent grade and 60 miles per hour on the level with a rating of 4000 horsepower for each locomotive. Each of the sub-stations will have a 2000 kilowatt generator set. To begin with some of them will have one generator set with room for two eventually, and others to begin with will have two sets and room for three eventually.

Puget Sound Floods

Following a period of unusually low water conditions in the rivers on the western slope of the Cascades, the low point of precipitation for the four months of August, September, October and November being 4.18, the lowest reached since 1895, when the precipitation was 3.19, unusually heavy rainfall accompanied by strong warm wind, known in the northwest as "Chinook" wind, brought tremendous rises in all the rivers on the western slope. At the Snoqualmie Falls hydro-electric plant of the Puget Sound Traction Light & Power Company the water reached a height of ten feet over the crest of the dam, the highest known since this plant was installed in 1898. The White and Puyallup rivers, upon which are located two other hydro-electric plants of the company, reached an unusually high mark and overflowed their banks. However, no interruption occurred in the operation of any of these plants. Usually in December river flows on the western slope are low. Conditions this year have resulted in an opposite situation. Plants of the company all came through this flood period in excellent condition.

Business of Municipal Plant Large

According to the annual report of Superintendent of Lighting J. D. Ross of Seattle, the new year starts off with more than 50,000 accounts on the books of the city lighting department, with prospects of a great increase in demand. The 1917 receipts were approximately \$1,350,000, of which about \$590,000 is surplus and depreciation. Surplus and depreciation have been invested in additions to the plant, but the demand has been so great that during the past two years \$425,000 short term notes have been issued to keep pace with the increase. A new steam plant is being constructed on Lake Union of 16,000 horsepower capacity and will be completed in three or four months, bringing the capacity of the Lake Union steam plant up to 30,000 horsepower. The city is also making preparations to expend \$5,000,000 in the development of a new project to meet the demands.

Strike Settled at Helena, Montana

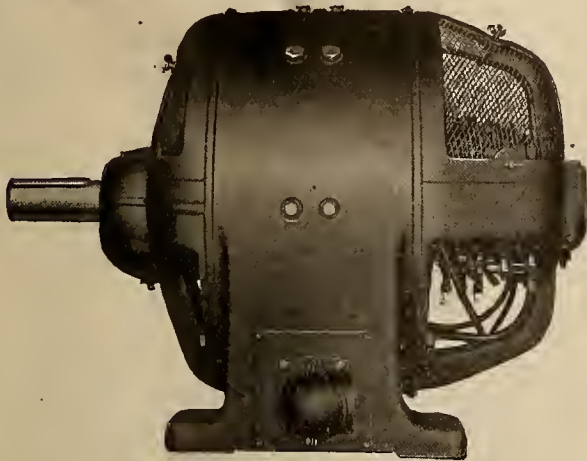
The strike of the Electrical Workers' Union at Helena, Mont., against the Helena Light & Railway Company has been settled after the workers had been out two weeks. G. Y. Harry, commissioner of conciliation for the federal department of labor, acted as intermediary and an agreement was reached. Each side conceded certain points. Electrical workers were granted a 20 per cent increase of wages asked, but gave up special privileges that had been granted to them by the company, amounting to about 50 cents a day.

LATEST IN EVERYTHING ELECTRICAL

(A new lock socket which prevents the removal of the lamp without the use of a master key is of interest to those who have occasion to place lamps in public places; a steel-jacketed heater unit which is particularly adapted for use in booths and small outdoor houses, an adjustable speed motor, and a series of new cleat receptacles are among the recent apparatus here described.—The Editor.)

R. F. ADJUSTABLE SPEED MOTORS

The General Electric Co., in Bulletin No. 41021 describes the R. F. line of adjustable speed motors which are the results of many years of experience and numerous tests under actual shop operation. There are many special advantages achieved in this R. F. type motor. Two worthy of mention



An adjustable speed motor

are the practical elimination of commutation troubles arising from abuse or careless operation; secondly, the main field coils are so designed as to withstand, without injury, full potential continuously with the armature at rest. Special attention has also been given to the efficiency regulation, stability and insulation.

PORCELAIN SHURLOK

Pass & Seymour have recently placed on the market their Shurlok Porcelain Socket. The great advantage of the Shurlok Socket is that it provides a practical means of locking the lamp in the socket so that it cannot be removed without the use of the master key. The special description given below is worthy of the attention of the electrical industry. The Shurlok screw with the special head is carefully designed so that it cannot become lost or misplaced. The lamp base is carefully positioned in the socket shell by especially placed ribs or corrugations on the inside of the porcelain shell, which prevent the lamp from being forced out



Porcelain Shurlok

of perfect alignment with the socket. The Porcelain Shurlok Boss or extension is of rugged construction—the socket is not damaged in ordinary rough usage that the porcelain socket is subjected to. These sockets are recommended for use over machinery, radiators, in public halls, basements, warerooms, store houses, ship yards, piers, freight houses, breweries, etc.; for use in abattoirs and all plans devoted to canning, condensing, drying, evaporating, cooking, or in any way preparing food products, because these sockets are not affected by the high percentages of steam, moisture or humidity that prevails. The porcelain shell is not disintegrated by any of the acids, fumes or gases which are present in these plants and are found to be so destructive to metal socket shells.

The standard porcelain socket or receptacle is com-

posed of a body and the cap or base. When the lamp is removed, the retaining screws are made accessible, and the socket must be installed before a lamp can be used. In locking the lamp in, by means of Shurlok, the shell and cap of the socket are locked so that they cannot be taken apart.

STEEL-JACKETED ELECTRIC HEATER UNIT

The steel-jacketed electric heater unit shown in the accompanying illustrations has been put to innumerable uses in all kinds of industrial plants. Besides such applications as in crane cabs; valve, pump and meter-houses; theatre ticket booths, there have been scores of miscellaneous applications.



C-H Space Heater Unit in a meter house

The ease of conducting electric current to remote corners, to moving crane cabs, etc., make the use of electric heat simpler than any other. The heater units shown are of 500 watts capacity, can be connected up in multiple to any A. C. or D. C. circuit where the voltage is not in excess of 250 volts. Only as many as are actually required need be installed, yet additions can be made as easily

as adding electric lamps. Just as lamps are placed singly or in groups in locations when light is required, so also are these units mounted singly or in groups in locations where heat is required.

The units are flat like an ordinary meter, the dimensions being 3-18 inch by 1½ by 23¾ inch. All parts are enclosed and no porcelain, cement, asbestos or moulded insulation material used. Insulated eyelet holes permit the use of ordinary screws for mounting—terminal connectors are placed at each end. In mounting, space is provided between units



Carton in which C-H Space Heater Units are packed (10 in a carton)

and between unit and surface on which it is mounted, to allow for a good circulation of air. The installation view shows one of these C-H units installed in the gas valve house in the coke plant of the Corrigan-McKinney Co., Cleveland. These units are designed and manufactured at the New York works of the Cutler-Hammer Mfg. Co., of Milwaukee.

CLEAT RECEPTACLES

A new line of porcelain receptacles has just been placed on the market by Harvey Hubbell, Inc. One of the new devices is a cleat receptacle which is supported by one screw through the center of the device. Another type of cleat receptacle is made with lugs on each side to accommodate wiring raised one inch from the surface. A third receptacle is intended for conduit box and metal sign work. This recep-



Harvey Hubbell cleat receptacles

tacle is constructed with five notches in the base. Bending one projection from the metal plate into any one of the notches will guarantee a permanent location for the receptacle after its installation. Another feature of this device is the screw ring which will permit the removal of the shell without disturbing the wiring.

A NEW CALENDAR

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has issued a very attractive calendar for 1918. It is featured by twelve large two-color illustrations of as many different operations in the manufacture of iron and steel. For the purpose of reducing the consumption of paper stock, this calendar has been printed on six sheets, instead of on twelve. The sheets are not to be torn off as used—simply turned back. When the sixth month has expired, reverse the calendar.

AMERICA'S ELECTRICAL CHRISTMAS A SUCCESS

Widespread reports indicate the success of the nationwide "America's Electrical Christmas" campaign, conducted under the general direction of The Society for Electrical Development. Unprecedented sales activity in all parts of the country, particularly by contractor-dealers, has resulted in a truly electrical Christmas. Following "America's Electrical Christmas," the society is continuing with its regular activities, modified or increased as the war demands change conditions. Considerable time is now being given to propaganda work for electrical equipment in freight terminals. Electric furnaces are receiving the attention of part of its engineering staff. Special effort is directed to helping the contractor-dealers care for the merchandising activities which some of the central stations have necessarily been forced to discontinue.

COURT DECISION ON PATENT INFRINGEMENT

In the litigation involving the Tubular Woven Fabric Company, with regard to the Osborn patent for flexible electrical conduits, the opinion handed down on November 14th by the Circuit Court of Appeals upholds the decision of the District Court, which decided that the defendant's use of cotton yarn as the helical strand of the tube was permissible. The Tubular Woven Fabric Co. substituted this cotton yarn strand for a paper twine strand when the Circuit Court reversed the decision of the District Court a little less than a year ago, and decided that their use of a paper twine helical strand was an infringement of the Osborn patent. The original case concerned the Osborn patent, No. 652,860, in which the question of its validity was at issue and the question of infringement as well. The patent was sustained, and it was held that the defendant's conduit, as then manufactured, infringed certain of its claims. The defendant thereafter modified its conduit and, as claimed here, thereby eliminated the infringing feature. The particular question was whether the defendant's modified or changed article of manufacture

was an infringement of the Osborn claims enumerated and as sustained and construed by the Court of Appeals in the original case. It became necessary, therefore, to consider the theory upon which the Osborn patent was sustained, and the intended scope of the claims involved as explained in the decision sustaining the patent and holding infringement. The means of manufacture and its means of properly stiffening are substantially different from the means described and employed by Osborn. The defendant produced its new conduit by combining elements old in the art under conditions which differ substantially from Osborn's conception, and by employing means which are quite independent of the means and combinations which Osborn described.

NEW BUILDING FOR THE ELECTRIC STORAGE BATTERY COMPANY

Thirty years ago the Electric Storage Battery Company laid the foundation for what is today the oldest and largest plant in America devoted exclusively to the manufacturing of storage batteries. The growth of the plant soon necessitated expansion, and one by one, units have been added



The new concrete home of the Electric Storage Battery Company, Philadelphia.

until in 1911 contracts were let out for the erection of an immense six-story concrete addition to the buildings already erected. This addition at the time was the largest of its form of construction in Philadelphia. Since then, however, the need for more and more space has been constant. The recently completed eight-story reinforced concrete building is probably one of the finest structures of its kind in the East. The buildings of the Electric Storage Battery Company, as they stand at present, contain over twenty acres of floor space.

SERVICE DEPARTMENT

Positions Open

Bookkeeper—Central station, Arizona. Handle consumers' ledgers; \$100 per month. Transportation expenses not paid.

Chief Hydro-electric Operator—Power plant, Nevada. Married man preferred. Permanent position to right man; \$130 per month, with house, fuel and light furnished.

Storekeeper—Power company, Monterey. Young man, 21 or 22; \$85 per month.

Charge of Commercial Sales—Power Company; \$150.

Salesman for Northwest—Engineering apparatus.

Stenographer—Manufacturers' Agency. Male. Opportunity for advance.

BOOKS AND BULLETINS FOR ELECTRICAL MEN

Report of Bureau of Standards

Scientific work of unusual volume and interest is described in the annual report of the Director of the Bureau of Standards, just issued. The work ranges from the testing of clinical thermometers to the publication of national electrical and gas codes. Since the war began, all branches of this scientific bureau have been conducting researches on technical problems of military application. The regular work, however, has not been overlooked. In fact, the variety and importance of the results obtained during the year in its scientific and technical researches are of unusual interest. The report describes much interesting work on standards for electrical measurements; radio researches; practical tests of the Bureau's radio fog-signaling system; radio direction finder; magnetic system of testing steels to ascertain quality for tool making, rail making, ball bearings, and the like; standardization of radium and radio-active preparations, including radium luminous paints for watch dials, and the dials of aviation instruments; standard practice codes issued as national standards for electric service and for gas service; work on standards for street lighting service, and on standards for telephone service; and the important work of safeguarding underground structures from the damage caused by stray electric currents.

Review of Developments

"Nineteen-seventeen Developments of the Cutler-Hammer Mfg. Co.," lists new products and appliances which have been devised in the various departments during the past year.

"Review of Developments in Electrical Apparatus During the Year 1917," by the Westinghouse Electric & Manufacturing Co., reveals the fact that the unprecedented demand for apparatus and appliances has called for abnormal efforts to speed up production, leaving little time to be devoted to development of new apparatus or modifications of existing lines.

War Problems

"Peace, How to Get It and Keep It," by the President of the British Trade Union Congress, and "The League of Peace and a Free Sea," are two of the war publications which give aspects of the war problems from the English standpoint.

An interesting book on German methods of economic expansion has recently been published in Paris that should prove of value to American manufacturers, exporters, and all those in any way engaged in work connected with foreign trade. The book, written by Henri Hauser, a professor in the University of Dijon, is entitled "Les Methodes Allemandes d'Expansion Economiques," and its importance may be judged of somewhat from the fact that the second edition was issued in 1916 by the well-known French house, "Librairie Armand Colin." The book, which is dedicated to French chambers of commerce at home and abroad, deals with the following matters: German economic evolution of the last 40 years; necessity of expansion; chief factors of expansion (including banking and credit); cartels and dumping; State aids; conquest of markets (including systematic study of markets and commercial and industrial alertness); and a rather trenchant conclusion driving home the commercial lessons that ought to be learned from Germany, and some words of advice as to what should be imitated and what rejected.

The War Trade Board at Washington, D. C., has published in pamphlet form a handbook of its Rules and Regulations, containing official information for shippers, exporters, importers and commercial and trade organizations. Information as to patents held by the enemy, export licenses, trading with the enemy, conservation lists and the like are here given in full.

New Catalogues

A Catalogue of Publications for 1917-1918 has been issued by the University of Chicago Press.

The McGraw-Hill Book Co. announces that it has taken over all the publications of the Clark Book Company of 27 William Street, New York City.

The Westinghouse catalogue of Industrial Apparatus has grouped all of the industrial electric heating apparatus which it manufactures.

John Wiley & Sons' "Catalogue of Scientific Books," revised to January 1, 1918, has recently been issued.

The Norman W. Henley Publishing Co. lists a group of books on the subject of Aviation.

Mining and Oil Libraries

As a means of augmenting the facilities for serving the public, which exist at the California State Mining Bureau's headquarters in the Ferry Building, San Francisco, arrangements have been made for placing the publications of the Bureau for reference and distribution at the following branch offices: Los Angeles, 520 Union League Building; Santa Maria, Taft, Bakersfield, Coalinga and Santa Paula. The reports and bulletins in question contain a fund of information on California's mining and oil industries which is available from no other source, and the public is cordially invited to make free use of the service offered.

Mining Bulletins

The California State Mining Bureau has issued a preliminary report on "Manganese and Chromium," by E. S. Boalich. Facts relative to the location of ore deposits, difficulties which must be overcome to make them available for ore, and methods to be employed if their immediate development is demanded, should be correlated, and this preliminary report precedes detailed information on the subject.

In the monthly statement of the Department of the Interior on Coal-Mine Fatalities in the United States for September, a list of permissible explosives, lamps and motors tested prior to October 31, 1917, is given. Deaths due to electricity total 97 in 1916, and 45 from January, 1917, to September, 1917.

BOOK REVIEWS

Engineering Mathematics

by Charles Proteus Steinmetz, Past President of the American Institute of Electrical Engineers; 6½x9½; 321 pp.; published by McGraw-Hill Book Co., Inc., of New York City, and for sale by the Technical Book Shop, San Francisco. Price, \$3.00.

This book discusses explicitly those branches of mathematics which are seldom adequately treated in college textbooks, and the volume should be an invaluable supplementary to the engineer who desires the effective and expeditious execution of his electrical engineering calculations. Considerable space is devoted to a descriptive outline of the introduction to the theory of functions; a paragraph to diophantine equations; and a section on engineering reports in its bearing on the success and recognition of the engineer's work.

The Lighting Art

by M. Luckiesh, physicist, Nela Research Laboratory, National Lamp Works of General Electric Company; size 9x6 in.; 224 pp.; published by the McGraw-Hill Book Company and for sale by the Technical Book Shop, San Francisco. Price \$2.50.

For the man who is selling electrical fixtures or for the man who is decorating his own windows, this treatise on the art of lighting must prove of interest. It is written from the general rather than the engineering viewpoint, the broad aspects of the problem being taken up, in contrast to the usual reference book of mathematical calculations. Such questions as distribution, lighting fixtures, simulating daylight, applications of colored light and the like are here considered as well as the broad fields of residence lighting, commercial lighting, stage and spectacular lighting. The book is very readable as well as of considerable scientific interest.

NEW ELECTRICAL DEVELOPMENTS

(Although the recent floods of the Northwest have caused much damage, few of the electric companies seem to have suffered. Activities throughout the Northwest and Pacific Coast district show great promise for the coming year. The completion of the White River hydro-electric station is predicted for the early spring. Los Angeles contemplates the installation of one of the longest high voltage lines in the country.—The Editor.)

THE PACIFIC NORTHWEST

BELLINGHAM, WASH.—The Lone Jack Mining Company contemplates the construction of a power plant, to cost about \$20,000, at its properties near Glacier, Wash.

EDMONDS, WASH.—An ordinance has been passed granting the Washington Coast Utilities a franchise for installing an operating and electric lighting system here.

ASTORIA, ORE.—The Pacific Power & Light Company is considering making extensions to its local service to meet the increasing demands for electricity for industrial purposes.

SEATTLE, WASH.—The National Engineering & Equipment Company, with offices in the L. C. Smith building, has secured a contract for constructing three electric ovens for the American Nitrogen Products Company, at La Grande, Wash.

PORT GAMBLE, WASH.—A 1000 kilowatt steam turbine unit will be installed by the Puget Mill Company. Contract for same has been awarded to the Allis-Chalmers Manufacturing Company. A. B. Pracna of Seattle is consulting engineer for this company.

SEATTLE, WASH.—Secretary Houston of the Department of Agriculture, Washington, D. C., regards with favor the request of Seattle for a permit for the development of a new municipal hydro-electric plant on the Skagit River within the national forest.

WARRENTON, ORE.—An outdoor substation is being installed by the Pacific Power & Light Company. This substation will be of a design similar to other outdoor substations on the system. These transformers are 300-kva, 25,000-6600/2200 volt outdoor type, single phase transformers.

SPOKANE, WASH.—William B. Dornberg, manager of the Lanark Mining Company at Illecillewaet, B. C., reports that a 300 horsepower plant, to cost about \$50,000, will be constructed this winter, and a ball mill and three tables and a flotation process at the mill to increase it to 150 capacity a day.

CLE ELUM, WASH.—The City Council is negotiating with the Northwestern Improvement Company to furnish electricity for lamps and motors in the South Cle Elum Addition, lying on the south side of the Yakima River. It is proposed to make an extension from the South Cle Elum system.

SEATTLE, WASH.—The City Engineer and members of the City Council recently made a trip to the Stilligumish River to inspect the power site offered to Seattle by the Skykomish Power Company for \$800,000. This concern claims that the city could realize \$700,000 from the sale of the timber on the site.

SEATTLE, WASH.—The issuance of \$5,000,000 of light fund utility warrants and the calling for bids for a completed hydro-electric power project, sufficient to insure the delivery to the city sub-station of approximately 25,000 kilowatts of continuous energy, is provided for in a bill passed by the city council.

TACOMA, WASH.—Damage estimated at \$15,000 has been caused in the city's \$3,000,000 hydro-electric power plant at La Grande as a result of silt and dirt brought down by the flood and congestion at the intake. The capacity of the big generators has been decreased, according to an an-

nouncement of Commissioner of Light and Water H. F. Gronen.

DAVENPORT, WASH.—A high tension line from the Long Lake plant of the Washington Water Power Company to the Milwaukee railway at a point about twelve miles south of Odessa is soon to be located, preliminary work having been completed by the Intermountain Power Company, which has the contract. The line through Lincoln county will be about 65 miles long. The cost is estimated at about \$100,000.

TACOMA, WASH.—The working of installing the additional penstock of the White River hydro-electric plant of the Puget Sound Traction, Light & Power Company is about three-fourths completed. Foundations are placed for the 16,000 k. v. a. generator and water wheel. This equipment has not yet arrived, but delivery is expected early in 1918. The work when completed will cost approximately \$750,000.

TACOMA, WASH.—To meet the industrial needs of Seattle and Tacoma a 13,000 horsepower generator will be installed at the Georgetown steam plant of the Puget Sound Traction, Light and Power Company, and this additional capacity will be in operation during the coming summer. When this development has been completed, the hydro-electric plants supplying Seattle and Tacoma with power for their industrial requirements will have a capacity of 107,997 horsepower.

SEATTLE, WASH.—Plans are being considered for increasing the transportation facilities to the Duwamish Valley district in Seattle, where the new industrial plants have been located. One of the plans presented is the use of two five-car electric trains twice each day to run from Fifth avenue and Jackson street to Ninth avenue South. The cost of installing this line is estimated at \$65,000. Other is to use the shuttle system running along Lucille street and First Avenue South.

PORTLAND, ORE.—Wilbur E. Coman, president and general manager of the Northwestern Electric Company, states that a contract has been awarded for the construction of an additional power plant which will increase the company's capacity 50 per cent. The plant will be located in the heart of the city on the river front, and will develop an equivalent of 13,500 horsepower or 10,000 kilowatts, with an eventual development of 30,000 kilowatts, or 40,000 horsepower, to cost about \$1,500,000.

BELLINGHAM, WASH.—Arrangements are being made to open the Cokedale mines in Skagit county in the near future, and a contract has been awarded for the construction of a railroad to the property. The mine will be equipped with electrically operated machinery, contract for which has been awarded to the Puget Sound Traction, Light & Power Company of Bellingham, which will erect a transmission line to the mine as soon as material can be secured. A substation will also be erected at the mine.

COLVILLE, WASH.—H. R. Williams, manager of the Stevens County Power & Light Company, is authority for the statement that power will be furnished to the Valley magnesite fields in the early spring. The Stevens County company is to supply electricity for lamps and motors to the Chewelah Magnesite Works, and is within half a mile of the Northwest Magnesite & American Mineral quarries. The Stevens county plant at Meyers Falls, on the Colville River, will be increased to its full capacity during the winter.

SEATTLE, WASH.—Around March 1st the Puget Sound Traction, Light & Power Company, Seattle, will complete the installation of its new unit at the White River or Lake Tapps hydro-electric station. Foundations have been laid for a 16,000 k. v. a. generator and water wheel. This is the largest single-runner, double-discharge Francis water turbine ever constructed. The new generator will have a capacity of 23,000 horsepower. Two generators, each with a capacity of 20,000 horsepower, are now in operation at this station.

KLAMATH FALLS, ORE.—The large dam of the California-Oregon Power Company across the Klamath River at Copco, 45 miles from Klamath Falls, has been completed. The company plans to generate 26,000 horsepower under the present development. An equal amount can be developed by the installation of additional units to the power plant. The construction of a smaller dam below the present one, which will bring the total development to 103,000 horsepower, is contemplated by the company. Electricity generated at the plant will be distributed throughout northern California and southern Oregon.

THE PACIFIC CENTRAL DISTRICT

MODESTO, CAL.—The Modesto Gas Company has been awarded the contract for supplying the gas lamp posts in the city at \$4.99 a post per month.

RICHMOND, CAL.—The street lighting system for the city of El Cerrito has been completed and turned on by the Western States Gas & Electric Company, Richmond division.

FRESNO, CAL.—The Fresno Interurban Railway Company is contemplating the construction of an extension from Sunmaid to Centerville, a distance of seven miles, through a new orange district.

STOCKTON, CAL.—A large paper mill is now in course of erection to which the Western States Gas & Electric Company will supply 1340 horsepower. This installation will operate at approximately 90 per cent load factor.

ALPAUGH, CAL.—The San Joaquin Light & Power Company has begun work on the erection of a new substation, to be located four miles south of Alpaugh. A high tension transmission line will be extended from Corcoran.

FAIROAKS, CAL.—Application has been made to the State Railroad Commission by R. A. Rose, owner of the local electric plant, to execute a promissory note for \$5500, the proceeds to be used to take up former notes and to pay for additions and improvements to the plant.

SACRAMENTO, CAL.—The bid of the Pacific Gas & Electric Company for furnishing the city with light and power for the present year and for the furnishing of incandescent lamps was accepted by the city commission. The rates were the same as last year for light and power.

EUREKA, CAL.—The taking over of the Bendixen lumber mill by the Rolph Shipbuilding Company and the enlargement of its plant will double the amount of current taken from the Western States Company, which is now installing a larger transformer at the yards.

MERCED, CAL.—The San Joaquin Light & Power Company is erecting an electric transmission line from the new power house at the site of the Merced Stone Company's interests to Coulterville. The company has a franchise at the latter place and will install an electric street lighting system.

PALO ALTO, CAL.—The city council has passed an ordinance calling a special election in Palo Alto for the purpose of submitting to the people a proposition to incur a bonded indebtedness to pay for the cost and installation of a Diesel engine electric generating unit for the municipal power plant.

SAN FRANCISCO, CAL.—Plans are being prepared for the construction of a new shipbuilding plant for the Pacific Coast Shipbuilding Company, which will include slips, docks, power plant, foundry and a number of machine shops, to cost

about \$500,000, in the upper bay near Port Costa. Frederick H. Meyer is architect.

CALISTOGA, CAL.—The Calistoga Electric Company has been authorized by the Railroad Commission of California to establish a new schedule of rates for electric service, with a monthly meter consumption basis of 10 cents per kilowatt-hour for the first 100 kw. hr., 5 cents per kilowatt hour for all over 100 kw. hr., and a minimum monthly charge of \$1 per meter.

LIVINGSTON, CAL.—The Livingston Farm Center has approved the resolution favoring the irrigation district plan recently indorsed by the directors of the County Farm Bureau, which provides that the drawings of the irrigated district be done by the electricity generated by power from the Merced river and from storage water, and also that the irrigation district have its own power and telephone system.

OAKDALE, CAL.—The Oakdale and South San Joaquin irrigation districts will receive a new proposition from the Sierra and San Francisco Power Company relative to a permanent storage plan, as a result of the visit to San Francisco of the two boards. The power company announced that it will be ready to proceed with the building of large storage reservoirs in the mountains along the Stanislaus river as soon as the project can be financed.

GRASS VALLEY, CAL.—Work has begun on the construction of a cold storage plant that will have a daily capacity of 50 tons of ice, with 75,000 cubic feet of storage space. The refrigerating plant will be operated by a large electric motor, which will be augmented by a steam plant, to be used as an auxiliary power. The plant is being built by local capital, and J. C. Jones of San Francisco, a refrigerating engineer, will have charge of construction.

SAN FRANCISCO, CAL.—The Southern Pacific Company, it is reported, will soon begin the work on erecting a high tension transmission line from its Fernside power house to Webster street, Alameda, and to remove the existing high tension line from Lincoln avenue. The cost of the transmission line is estimated at \$60,000. The proposed new line will transmit energy from the main plant to the substations at West Oakland and Thousand Oaks. E. H. Miller is engineer in charge.

SAN FRANCISCO, CAL.—There will be no dividend paid on Pacific Gas & Electric Company's common stock for the last quarter of the old year, the directors having decided to pass the regular disbursement of \$1.25 per share that has been paid quarterly since April, 1916. Frank G. Drumm, president of the company, said that the directors had decided to pass the dividend because such action would enable the company to start the new year with a substantial cash balance in the treasury.

OAKDALE, CAL.—Plans have been practically completed for the purchase by the Pacific Gas & Electric Company of the power sites and electric plants of the Utica Gold Mining Company, which furnishes power and light to Melones, Angels, San Andreas and other mountain towns, and operates a big power plant for its own needs. It is believed that the Utica will transfer to the same concern its joint filing with the Oakdale irrigation district, on the Spicer Meadows reservoir. This project calls for the construction of a reservoir to hold 65,000 acre feet, the water of which the Utica was to use for power purposes and the extension of its light and power lines.

THE PACIFIC SOUTHWEST

MESA, ARIZ.—A new Bell telephone system is being installed here.

TUCSON, ARIZ.—Property owners of North Sixth avenue have been granted a petition for extending the ornamental lighting system to the railway tracks.

WATTS, CAL.—The board of trustees has awarded the contract for \$11,715.31 to C. W. Sparks for the installation of an ornamental lighting system on several streets.

SANTA MONICA, CAL.—The city commissioners have granted Erminio Gamberi a 25-year franchise to operate electric trams on the Ocean front promenade in Santa Monica.

SANTA BARBARA, CAL.—The estimated cost of repairing the transmission line of the Santa Barbara Gas & Electric Company, which was burned over by forest fire recently, is about \$2500.

GLENDALE, CAL.—Municipal ownership of its water plant and the purchase of electric equipment in Tropico have been approved at a mass meeting held recently. A bond issue of \$100,000 is needed.

SANTA BARBARA, CAL.—The city council is considering the installation of a municipal electric light plant in Santa Barbara. The construction of a hydro-electric plant at Mission Tunnel is under consideration.

OXNARD, CAL.—Consideration of auxiliary pumping system using electric power for city water system occupied a recent session of the city trustees. Estimates of the cost of erecting such a plant will be obtained.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded a contract by the board of supervisors to furnish electricity for lighting the El Modena, Garden Grove and Tustin lighting districts with electricity.

LOS ANGELES, CAL.—The United Power Company of Los Angeles, which has acquired the properties of the Electric Power Company in San Gabriel canyon, it is reported, contemplates the construction of a new power plant at Iron Fork.

ANAHEIM, CAL.—Preparations are being made for the installation of new machinery in the municipal electric-light plant, including a tandem cross-compound engine, an electric generator, exciter, boilers, pumps, etc., for which bids have been received.

BELLA VISTA, CAL.—The planing mill and electric plant of the Shasta Land & Timber Company was recently damaged by fire, causing a loss of about \$70,000. The plant was under lease to the Shasta Commercial Company. Post office address Bella Vista, R. F. D. from Palo Cedro.

KINGMAN, ARIZ.—The Desert Power & Water Company is planning to extend its service lines to the Hackberry Consolidated mill at Hackberry. The cost of installation of the line will be about \$90,000. It is also planned to extend a line to the Cyclopic, thirty miles north of Chloride.

BISBEE, ARIZ.—The city council, we are informed, does not contemplate calling an election to vote on the proposal to issue \$375,000 in bonds for the construction of a new electric light plant, water works system and a gas generating system as reported in the issue of January 1st. The Bisbee Improvement Company furnishes electrical service in Bisbee.

YUMA, ARIZ.—The Southern Sierras Power Company has abandoned temporarily its project of extending its power transmission line from Yuma through Gilabend to Ajo, on account of the difficulty in having orders for equipment filled. The special purpose of the proposed construction was to afford power for operating irrigation pumping plants and mining machinery.

LOS ANGELES, CAL.—One of the longest voltage lines in the country is contemplated by the Nevada-California Power Company, with headquarters in Riverside. The cost of installation would be approximately \$300,000 for the pole line. Should the deal become effective service would extend over a distance of 300 miles from Inyo county almost to the Utah line.

LOS ANGELES, CAL.—Announcement has been made that the sum of \$55,370 has been authorized for various expenditures by the board of directors of Southern California Telegraph Company for consolidation of the manual and automatic systems. It is also stated that an appropriation of \$33,090 has been authorized to increase toll facilities between Los Angeles, Bakersfield, El Centro, El Centro Junction and Yuma, Ariz.

PASADENA, CAL.—The Southern California Edison Company has submitted a new offer to the city for the purchase of the company's distributing system within the city limits. The former price named was \$500,714; the new offer is \$488,223. Further the company offers to sell energy on a 15-year contract, instead of a 30-year basis as was originally proposed. The city refused the first offer and began to purchase power from the city of Los Angeles.

SAN BERNARDINO, CAL.—Improvements and extensions are under way by the Southern California Edison Company, which will involve an expenditure of about \$200,000 and will include the construction of a joint pole line with the Southern Sierras Power Company out of E street, rebuilding of many lines within the city, erection of a new "tie-in" line from the Fontana Company's power plant north of Rialto, and a new line along Base Line into this city, in addition to a new line to connect with the Mentone line and a connection with the 60,000-volt line from the Long Beach plant, and the construction of a warehouse and service headquarters at 240 E street.

INTER-MOUNTAIN DISTRICT

BLACKFOOT, IDAHO.—The question of installing a cluster lighting system is being considered.

MISSOULA, MONT.—The Missoula Light & Water Company has filed a notice of increase in capital stock from \$1,000,000 to \$1,500,000.

HARLOWTON, MONT.—The city has awarded a contract to the Montana Power Company for the installation of an ornamental lighting system, to cost about \$4000.

BUTTE, MONT.—Havre Electric, Steam, Heat & Telephone Company, with principal offices here, has dissolved. The petition of dissolution states that there are no debts or obligations.

SPEARFISH, SOUTH DAKOTA.—There was placed in service in December for the Homestake Mining Company, at Spearfish, South Dakota, a 4000 kw. hydro-electric plant. The company already had one plant of 4000 kw.

NAMPA, IDAHO.—Plans have been completed by the Carnation Milk Products Company of Seattle for the erection of a plant in Nampa, to cost about \$175,000. The plans include a three-story boiler house, 50 ft. by 100 ft.

SALT LAKE CITY, UTAH.—The battery charging station of the Capitol Electric Company, 21 West First South street, was visited by fire recently and damage, which is covered by insurance, is estimated to amount to \$2000.

DYER, NEV.—Jos. L. Giroux has been granted permission to appropriate 6 second feet of McAfee creek, tributary to White Mountain streams, in Mono county, for agricultural purposes on 480 acres. A concrete ditch 6844 feet in length will conduct the water to place of use. The estimated cost is \$8000.

LEWISVILLE, IDAHO.—The court recently dismissed action brought against the Utah Power & Light Company by the village of Lewiston. The town asked that the company be required to extend its lines to furnish them with power and light, but it appeared that action had already been taken by the company to this end.

HOT SPRINGS, MONT.—Conrad Smith and F. E. Campbell, it is reported, are making arrangements to install a lighting and power plant in Hot Springs to serve the town and contiguous territory. The town council, it is understood, has agreed to grant them a franchise, and work will begin soon after the first of the year.

MONTOUR, IDAHO.—Plans are nearing completion for the installation of a pumping plant to irrigate 2200 acres of the land owned by R. E. Noland south and east of Montour at an approximate cost of \$30,000. The pumping plant is to be located on the river three miles above Montour and will consist of a centrifugal pump driven by electric power.

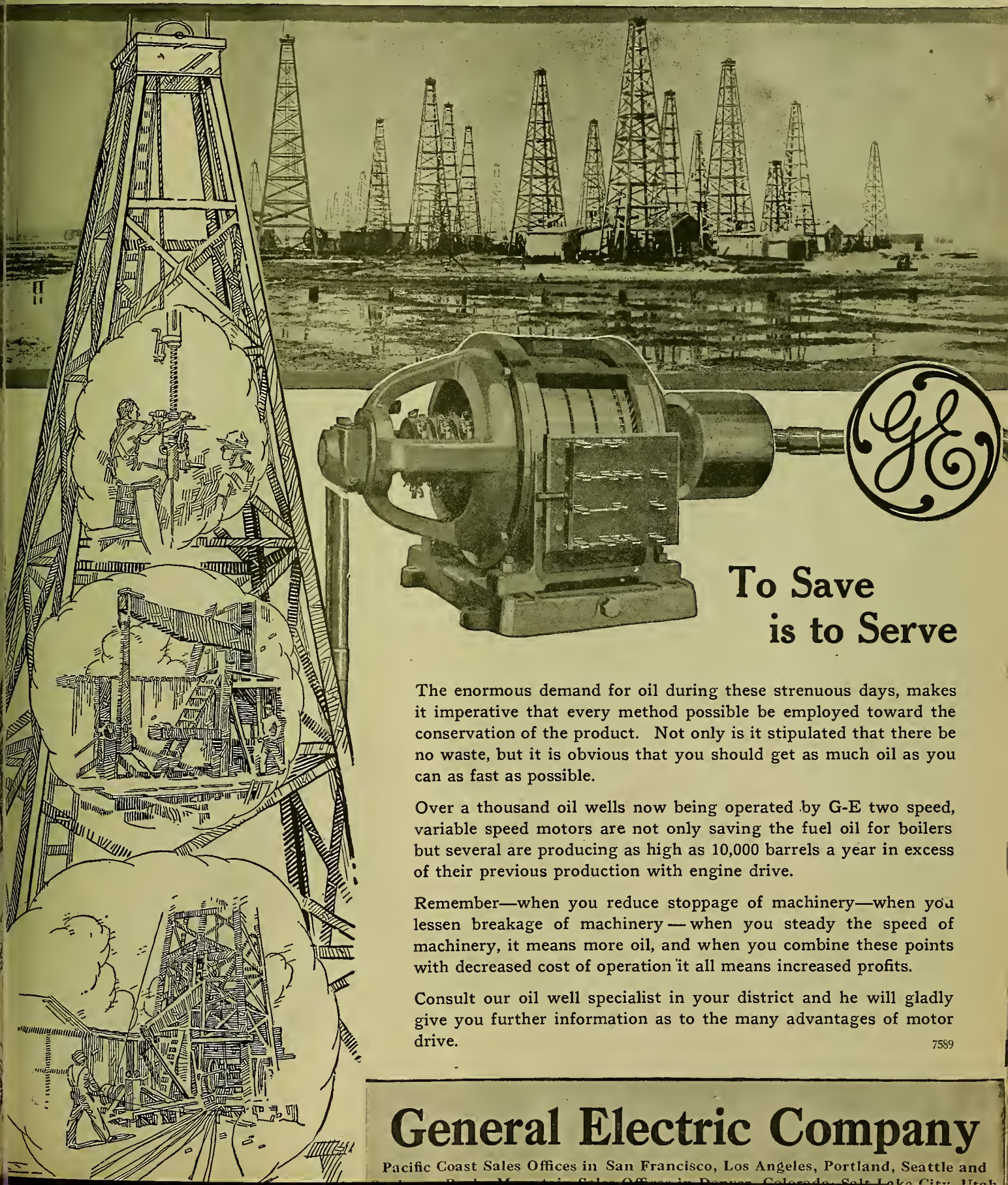
In This Issue: War Service of Electrical Energy

JOURNAL OF ELECTRICITY

VOL. 40 NO. 3

SAN FRANCISCO, FEBRUARY 1, 1918

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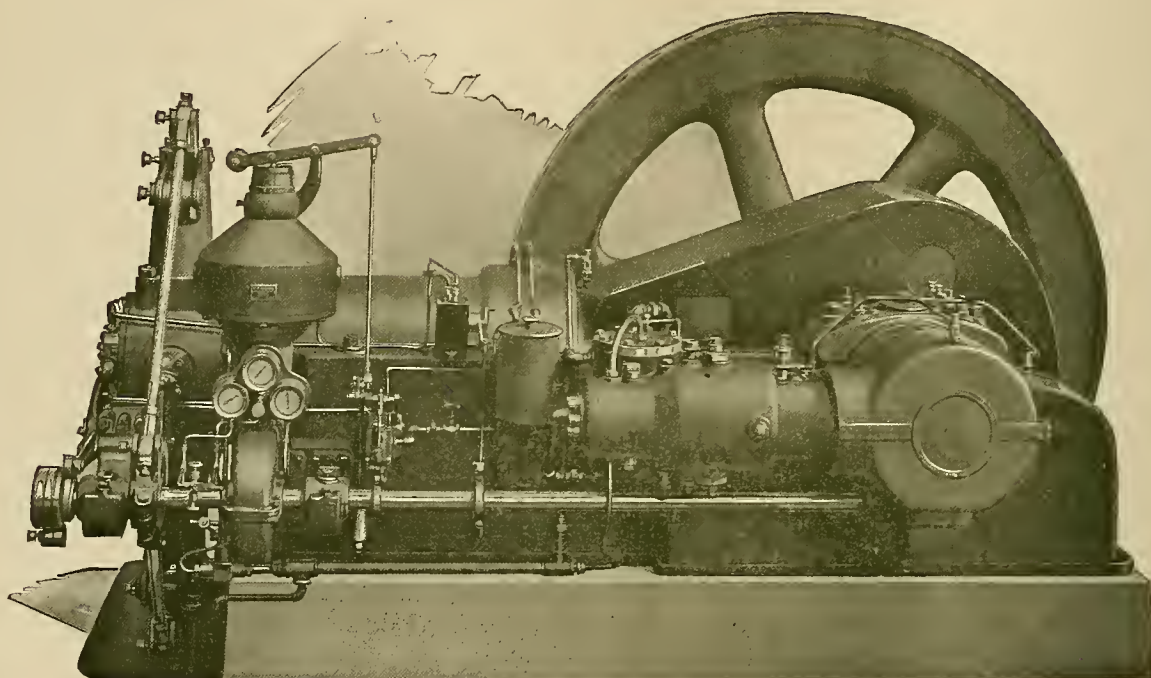
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VOLUME 40

SAN FRANCISCO, FEBRUARY 1, 1918

NUMBER 3

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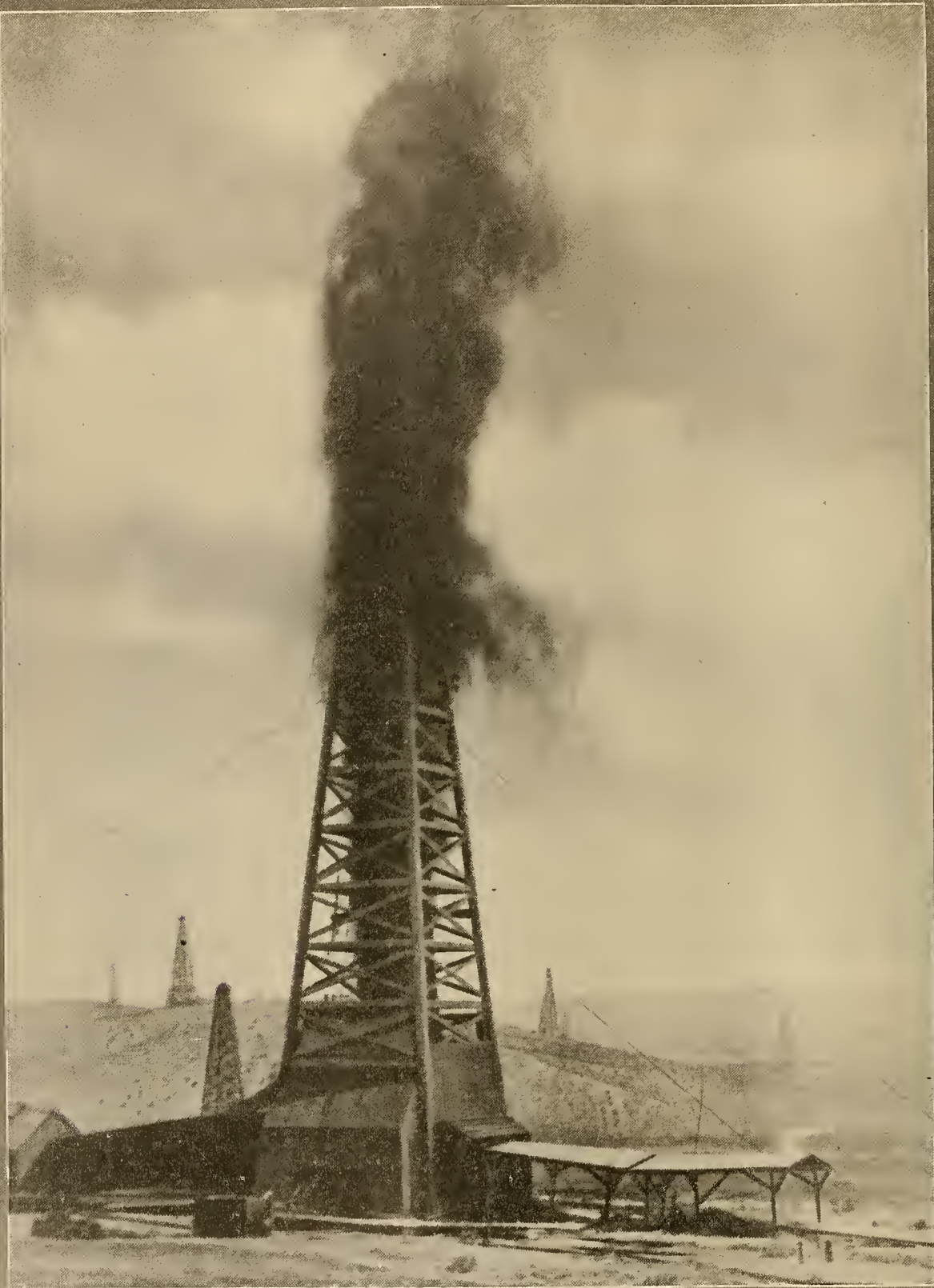
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HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—VI

Fuel oil, typified in its war production by the giant gusher shown above, is today being mined in the West at the rate of almost a hundred million barrels annually. But in these momentous times electrical energy from the waters of the high Sierras is carrying the increasing burden, not alone in agriculture and industry but in the drilling and the pumping of the oil itself.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

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AFTER-THE-WAR VALUE OF WAR SERVICE

The war service of electrical energy in the West, which is discussed at considerable length on other pages of this issue, has a deep and significant meaning for the future commercial and industrial activity of this growing section.

The building of a new power plant at this period, or the installation of a new industry, or even the breaking in of new agricultural land hitherto unproductive, is today the linking of activities that, harmoniously joined with national effort from all other quarters, means the successful termination of the world struggle for democracy. This in itself justifies the immense outlay of agricultural and industrial development now under way in the West.

But beneath it all there is even a deeper, fuller meaning. The harnessing of water power in the mountain fastnesses is the creation of industrial wealth that neither the ravages of war nor the elements of the passing seasons can wear out or diminish in the slightest degree. So long as the sun continues operative in drawing up the vapory supply from the rivers, lakes and oceans, and so long as the mountain fastnesses are blessed with nature's seasonal downpour, so long will activities set in motion during this trying period of the world's history be available in helpfulness and blessings for man.

When we of the West, as a consequence, view the mighty shipbuilding now under way in our sea ports, the giant industries that are springing up on all hands in a district hitherto unaccustomed to such activities, or the increasing production of agricultural wealth in the fertile valleys of the West—in all of which electrical energy is playing an indisputable part—it is difficult indeed to fully estimate the after-the-war value of such war service.

Suffice it to say, however, that the prestige that is being gained from our coast shipping points and the increasing availability of the splendid water powers of the West for industry and agriculture, unquestionably means the building of a commercial empire that is destined to play an invaluable role of helpfulness in the reconstruction years after the war, and as a consequence, war service in the West in electrical lines, has a substantiality to it that is as permanent for the future as it is potent in its patriotic effect at the present.

Editorial comment on the power crisis was set forth in the issue of the Journal of Electricity for January 1, 1918, in which the govern-

Interconnection of Power Plants

mental authorities at Washington were urged to pass needed legislation looking toward a more liberal policy of water power development upon the national domain. At that time it was suggested that the power companies themselves could hasten action by more unified and effective interconnection of service and other economies, the result of which would convince the federal authorities of the justness of this request.

It is gratifying to note that the federal authorities are following this suggestion at Washington, and that a marked attitude of mutual willingness on the part of the power companies to take advantage of interconnection economies is being felt in all sections of the West.

Southern California is now soon to be one vast network of interconnection, which will include the joining of the Southern Sierra Power Company, the Southern California Edison Company, and the San Diego Consolidated Gas & Electric Company, creating again a world's record in interconnection and length of transmission service.

In Central California a most marked advance has been made in the past semi-monthly period. Hundreds of thousands of barrels of fuel oil are expected to be saved in this district through a war conservation agreement reached recently by the three largest electric power companies of this state.

Under the agreement, the Pacific Gas & Electric Company, the Great Western Power Company, and the Sierra and San Francisco Power Company, serving thirty-eight counties of Central and Northern California with electric power and light, have unified all

their activities for the period of the war, and the amalgamated properties will be operated under one management, headed by P. M. Downing, who is now chief engineer of the electrical department of the Pacific Gas & Electric Company.

Steam generating plants will be closed wherever it can be done without denying good service to the public.

About forty thousand square miles of territory will be included in the unified war-time service, which is perhaps the greatest area in the world served with electric power and light by a single corporation management. Beyond promising to enforce the unified electric service during the war, the power companies have said that the single service will be continued after the war just so long as it may be deemed to be in the public interest.

Again in the Northwest gigantic strides are being made in interconnection. The Pacific Power & Light Company has just recently built 65 miles of 110-kv. line from Pasco to Lind, connecting there with the Washington Water Power Company. The cost, including the new Pasco substation and the dispatching office, is approximately \$600,000.

Further to the west, the Pacific Power & Light Company is building a second interconnecting line from Powerdale on the Hood River across the Columbia River on high towers, and connecting with the Northwestern Electric Company at the White Salmon plant. This makes a three-cornered connection with the Pacific Power and Light Company, the Northwestern Electric Company and the Portland Railway, Light & Power Company. The cost of the line was about \$125,000.

And, as a final triumph in interconnection, the Washington Water Power Company will soon be connected with the Puget Sound Traction, Light & Power Company. Since the Washington Water Power Company is to the east already connected with the Montana Power Company, this will make one grand system of pulsating electrical energy from Harlowton in Eastern Montana across Idaho to Seattle in the north and Portland to the south.

These movements toward unification are excellent and such willingness to aid in the present national crisis will not be overlooked by the public generally.

"Germany's Great American Ally" is the name that has been applied to fire—and indeed it has done yeoman's service in Germany's cause in these last few months. Almost every morning's newspaper brings report of the destruction of some grain warehouse or factory, a loss that is quite as effective for the enemy's purpose as though a ship had been sunk or a storehouse at the front destroyed. The important point is that each one of these fires reported is due in some measure to carelessness. Whether it be an accidental conflagration—and in the speeding up process of all war industry there are many more opportunities for such accidents—or of incendiary nature, a sufficient watchfulness could have prevented the blaze. At a recent convention of fire underwriters the question of adequate watchman service was brought up. Many companies utilize the posi-

Carelessness and the Fire Hazard

tion of watchman as a reward for employes incapacitated through age or accident in their service. The futility of such guards was proved time and again in a series of experiments in which the fire deputies found no difficulty in stepping past the watchmen and secreting themselves in the grain elevator or factory, as the case might be.

An interesting series of experiments in the fire tests of building columns has recently been carried on by the National Bureau of Standards, as elsewhere reported in these pages. They should be of interest to any who suffer fire hazards.

Closer co-operative helpfulness is possible between the architects and the various branches of the electrical industry. This was recently most forcefully brought out at a meeting of the San Francisco Electrical Development League, devoted to a discussion of this subject, in which discussion a number of noted architects took part.

The Architect and the Electrical Industry

Louis C. Mullgardt, designer of the lovely Court of the Ages, and Bernard R. Maybeck, designer of the beautiful Palace of Fine Arts at the Panama-Pacific International Exposition, spoke on behalf of the architects and explained that complete co-operation was hindered rather than helped by the volumes of conflicting and confusing literature now issued by the different electrical supply concerns. They said if the electrical people could unite and standardize their requirements—from an architectural standpoint—and express themselves in less technical language, they would facilitate co-operative work on the part of the architects who do not profess to be expert electricians.

The system of separate inspections by municipal and state authorities of electric light and electric power, and steam heat, gaslight and plumbing also tended to baffle the architects. If the electric and power concerns could secure some legislation to consolidate these inspections, the speakers said, it would be a great advantage.

Here is a real service that men of the electrical industry throughout the West can undertake at once. A broad field of greatly enlarged applications of electric lighting and appliances is possible in the home and in buildings generally. The men of the electrical industry would do well to weigh carefully these suggestions and by making their appeal understandable to the architect, much of the confusion, misapplication and misunderstanding of the past may be avoided.

The subject is clearly one of such importance that it should receive the immediate united backing of all branches of the industry.

In this day of national experiment on a large scale, the average layman is impressed more and more with the fact that economics and the problems of business and social balances have not been reduced to an exact science. He still clings to the conviction that there are definite laws which underlie all such reactions to changes, and that if one thought clearly enough with persistent enough logic, he could avoid the mistakes of actions based upon generalities in the dark.

A Scientific Attitude in Valuation

This habit of approximate judgment in business matters is never more striking than where the business field overlaps that of such an exact science as engineering. The problem of the valuation of public utility properties is still one much clouded with conjecture and decided all too often with a mere individual judgment of what is "about fair," rather than upon a recognition of underlying causes and just compensations. Expert testimony in the past has based its opinion upon former court decisions, without recognition of its duty to establish the truth of the situation as clearly as possible in order that the court might re-decide upon more scientific grounds. The question of the fair rate to be allowed public utilities, or the price to be fixed in condemnation proceedings, is not a matter to be determined by legal enactment at random, but by the facts of the case.

The situation is an extremely live one today. Applications for increased rates for electricity and transportation, in the face of increased operating expenses, are before practically every rate-fixing commission in the country. The tying in of the great power lines and the reorganization and amalgamation of many of the large manufacturing concerns, involve the careful establishing of values.

In this connection the remarkable series of articles by C. E. Grunsky on valuation problems, which have been appearing in the columns of the Journal of Electricity, is of particular interest. A more hopeful attitude for the public utility owner has been adopted recently by various rate-fixing bodies—and new light is being welcomed upon the intricate problems involved. Mr. Grunsky was perhaps the first to point out the necessity for a strictly scientific attitude toward the economic questions involved in valuation, and has contributed much to the present growing spirit of openmindedness. The question of "going value," a discussion of which appears elsewhere under his name, is perhaps the most intricate and involved of any problem which confronts the valuation expert, and one which has in the past been determined almost wholly by personal approximations. That there may be a logical determination of the intangible elements involved, as well as of physical properties, is here pointed out and sustained by the recent recognition of the courts.

All of us have from time to time heard of the dickerings necessary to make a purchase with the

Engineering. Purchases in the Orient

Turk, the Persian, and other Oriental merchants. And so the American engineer now engaged in professional work in the Orient, is not wholly unprepared to question the price asked for various articles of purchase he desires to make.

The question of knowing how to arrive at the real price of Oriental wares is not only of passing interest

to the tourist, but is indeed one of vital and economic importance to the engineer or construction company that may have aspirations toward acquiring success in the Orient. For herein lies the success or failure of many such undertakings.

The Oriental character is such that one should not pass judgment too harshly in criticising their system of "two prices." It has been their method of doing business for centuries and to them it is the natural and fair way of arriving at a proper price of sale. In the native mind all salesmanship is considered something in the nature of an auction campaign in which the purchaser states the price at which he will do business and the salesman may take the offer or not at will.

Hence the holding of an open price at which dickering may begin, and the reservation of an unmarked price at which it may cease, is wherein the Oriental mind honestly strives for successful salesmanship. Consequently the holding of two prices is not a reflection upon the honesty of the merchant, but is a racial characteristic upon which the engineer should carefully figure in making his estimates of purchases.

In China the question of two prices is especially pronounced, and yet everyone who has had real business dealings with the Chinese merchant finds him at heart thoroughly honest and willing to abide by his word to the last ditch.

In America we are becoming convinced that the true ethics in the fixing of prices compels us to compute the cost of carrying on a business plus the cost of manufacture, and then add a reasonable amount for profit. This practice is especially noticeable in all the rulings of rate-fixing boards in the handling of public utility problems. Indeed, so convinced are we now becoming of the reasonableness of this fundamental truth that almost all business prices are now being re-adjusted to meet this law of reasonable returns. No longer does the just and really successful business man attempt to gather as profit all that the traffic will stand, but rather only such a return as he feels justified in making over and above the cost price of production.

In China, however, the old system is in full swing. The merchant considers that you know your business and that you are thoroughly familiar with the proper value of the wares you desire to purchase. As a consequence, he stands by with his figures until he is satisfied he knows your real level of valuations, and if it is of sufficient amount to allow him a profit, he will allow a sale to be made.

Hence it is of utmost importance that one should thoroughly familiarize himself with the real market value of wares and produce of the Far East before attempting to drive a purchase, for the confidence given to one's conscious expression, is of utmost value in closing the deal at a reasonable figure.

THE NEW JOURNAL SERVICE: The increasing activities of the Journal of Electricity have resulted in many requests being made to have the current issues on sale at the various book stands and news stands of the West. In order to meet in a measure this growing demand on the part of the readers of the Journal, current copies of each issue may now be purchased at the leading stands in Berkeley, Oakland, Alameda and San Francisco. This service will be extended to other cities of the West as soon as the outlay seems justifiable. At present, however, the placing of the Journal on the news stands of the cities of the Bay Region, and on all ferry news stands and at the Ferry Building in San Francisco—a building through which pass more people daily than any other building in the world—it is believed that a distinct start is made in making the Journal available to thousands of readers that otherwise would not meet its helpful influence.



THE SNOW SHEDS OF THE SIERRAS

The rugged pinacles of the Sierras bedecked with eternal snows offer opportunities for water storage and consequent maximum power development of some nine million horsepower.

WAR SERVICE OF ELECTRICAL ENERGY

BY ROBERT SIBLEY

(That hydro-electric energy is rendering war service to the nation today in a manner almost beyond human imagination is the firm conviction of those who in these momentous times, scan closely the industrial and agricultural life of the West. Here is a pictorial exhibit of what the editor of the Journal of Electricity saw while recently making a tour of the great San Joaquin Valley of California—a valley of five million acres, perhaps the largest and most productive agricultural district in the world dependent upon irrigation and fed in large measure by electrically operated pumps.—The Editor.)



An Emergency Overflow from a Power Canal

WHILE the American nation is seemingly engrossed in the flare of trumpets, the beating of drums and the training of men, for the defense of democracy, and the great seaports of the nation resound with the hum of the riveters at work on the building of a giant emergency fleet, this article is written that there may be passed down to all posterity a record of how electrical energy generated in the mountain fastnesses of the West is today making possible the conservation of fuel necessary to maintain our navy and

drive the great merchant marine so soon to be ours, and yet at the same time keep the rich agricultural districts of the West in a maximum state of efficiency in supplying our soldiers and sailors with the necessary food products to sustain life and activity in industry at home and service abroad.

And best of all, while this activity is thus rendering an invaluable aid in the present crisis, it is at the same time building up industry and agriculture that add a permanent wealth to the West that will remain throughout all ages.

Long since, the blind poet Milton immortalized these beautiful words, "They also serve who only stand and wait." This waiting attitude with willingness to serve is so wonderfully embodied in the giant power lines of the West that trail their way down from the snow-capped Sierras into a formerly arid waste—a waste that had a solemnity of stillness in its lack of usefulness for man to such a degree that this feature alone at one time gave this section a distinction to greatness in the annals of the nation—as to give a new meaning to the vision of Milton should one apply his saying to the accomplishments of hydro-electric transmission of energy in its service to man.

It is hence the purpose of this article, that the Journal of Electricity in its jubilee year of thirty years of service to the nation, should recount in an authentic and authoritative way, some of the things that go to show how hydro-electric energy in the West presents itself as an invaluable aid in making forever secure the liberties of free peoples and the democracy of the World.

Already there has been invested in hydro-electric



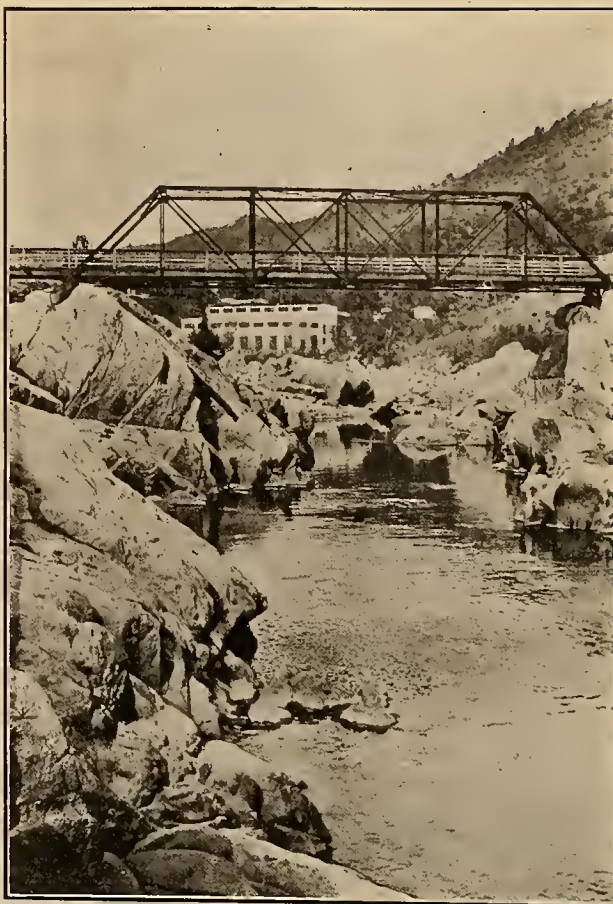
Transporting Heavy Machinery by Motor Truck

activities of the West some three-quarters of a billion dollars and something over eight hundred thousand horsepower of electric energy are as a consequence available for the driving of wheels of industry and the pumping of water for irrigation.

In normal years about 8 per cent of the electrical energy consumed in Southern California is produced by steam electric generation. Due to a growing lack of hydro-electric energy in the West, this proportion increased to 30 per cent in the past year in that section. Fuel oil has increased in value, on the other hand, from a prevailing price of 60 cents per barrel to \$1.35, and in some instances \$1.55, per barrel. At the same time the fuel oil in storage is decreasing at the rate of 1,000,000 barrels per month. The situation is, as a consequence, serious. If such a condition continues, a marked crippling of agricultural and industrial production must perforce be the outcome.

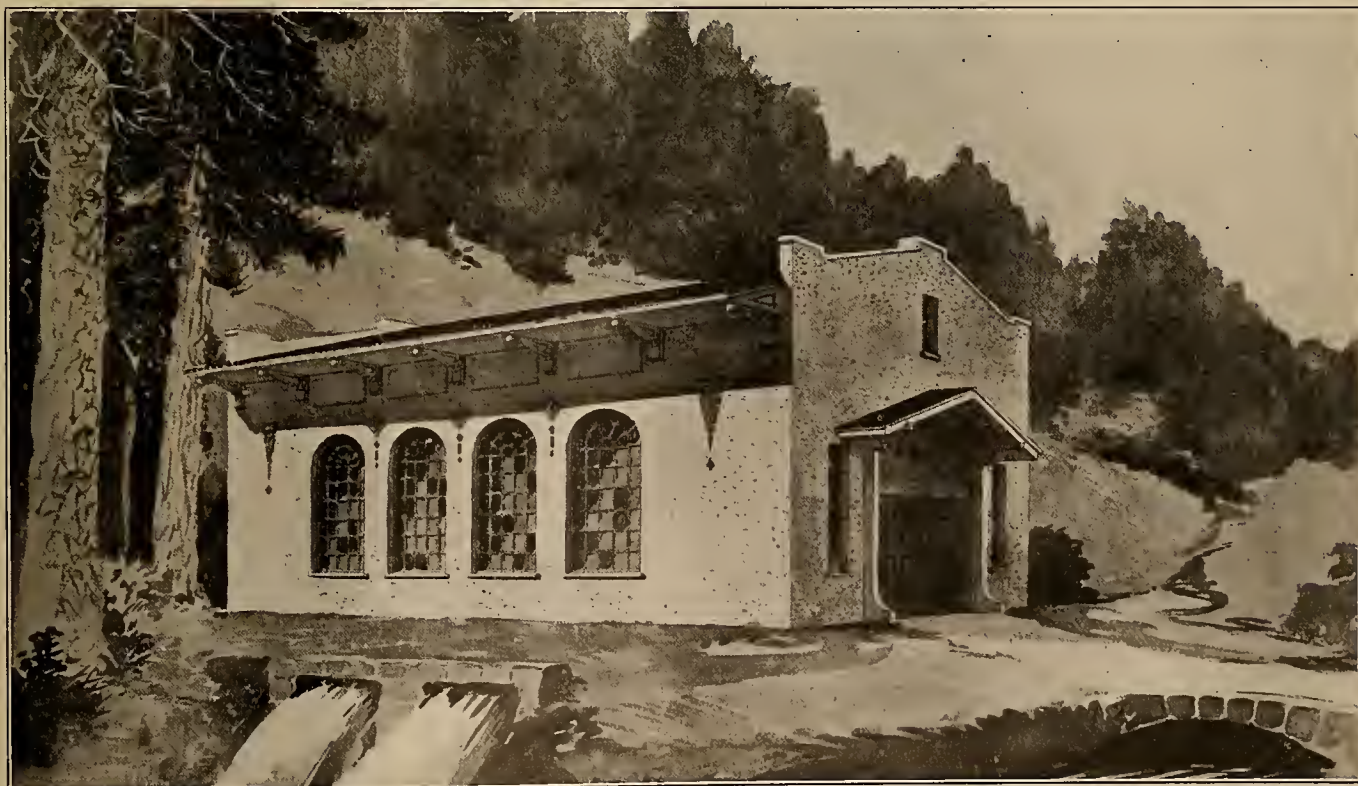
In order that our readers and the public generally may be advised of this situation, and also of the marked service that hydro-electric development is doing to meet this emergency in fuel oil production, an intensive study has been made of a typical hydro-electric utility of the West, that of the San Joaquin Light & Power Corporation, which feeds an agricultural district of some five million acres, perhaps the greatest lay of land in the world served by electrical energy—a lay of land of marked fertility and yet largely dependent upon electrical irrigation pumping for its development.

This company not only generates hydro-electric energy in the high Sierras in a number of different units, but in the great oil district near Bakersfield it has a steam auxiliary for electric generation that has



THE SAN JOAQUIN RIVER

Observe the low flow condition of this river, which is one of the largest in California. The determination of the variation in stream flow is an important factor in war service in the West, as upon this information possible power development is computed.



THE SAN JOAQUIN POWER HOUSE NO. 2

Here is a brand new power house which may be designated as a war baby, since its arrival has taken place subsequent to the declaration of war with Germany. Into the pinstock pipes are passed the waters of the north fork of the north fork of the San Joaquin River. These waters are dropped a vertical distance of 306 feet, thus operating a new generator of 3000 kw. installed capacity.



San Joaquin Power House No. 1, of 16,000 kw. Capacity

formerly used a hundred thousand barrels of oil annually for this purpose. As an emergency service, however, the next sixty days will witness this plant operated by natural gas now going to waste. This instance shows how war service ideals are being put into actual operation in the West. Not only this, but the enormous increase of the electric drive in the oil fields during recent months is again a striking feature of war service work, as time, labor and material are again conserved, to say nothing of the financial gain that is accomplished and the introduction of more efficient methods for the building up of industry after the war.

With all these ideas in view, then, we shall first briefly describe the system of the San Joaquin Light & Power Corporation, and by pictorial exhibits in the following pages set forth convincing proof of the genuine war service activities that these companies are rendering in the West. As a consequence immediate governmental encouragement for further development on the public domain should be granted. Indeed, in these splendid privately developed enterprises now so firmly and fairly operating under state utility regulation, a debt of gratitude on the part of the public is due them for the vision and constructive genius that has been displayed.

The San Joaquin Development

Situated in the heart of the beautiful snow-capped Sierras, an earth and rock fill dam with a reinforced concrete corewall has been constructed to store the water of the north fork of the north fork of the San Joaquin River. In normal years 45,000 acre feet of water is here stored on July 1st of each year.

Three power plants, known as San Joaquin No. 1, No. 2, and No. 3, are fed in succession from these impounded waters in addition to the natural flow of the river.

Power House No. 3 takes its water supply direct from the Crane Valley Reservoir through a ditch which has a carrying capacity of 115 cubic feet of water per second. The water is dropped through

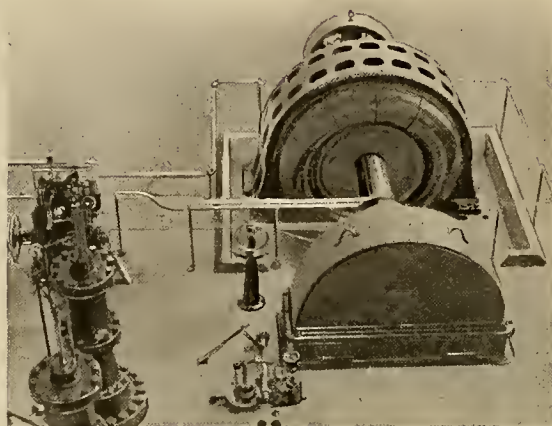
penstock pipes a vertical distance of 401 feet, thus generating electrical energy in two 1000 kw. generators.

From an equalizing reservoir of 220 acre feet capacity immediately below Power House No. 3, a recent installation has been perfected designated Power House No. 2, which drops these same waters a vertical distance of 306 feet, thus operating a new generator of 3000 kw. installed capacity.

Again these self same waters, replenished by the waters of the south fork of the north fork, are taken through a third conduit of 135 cubic feet per second capacity and dropped a vertical distance of 1425 feet. This generating plant, known as Power House No. 1, is the largest of the San Joaquin Light & Power Company's system. The total installed capacity is 16,000 kw., generated by four units of equal capacity. A forebay of 22 acre feet is provided at the head of the penstock pipes to take care of fluctuations in load. The water is discharged directly into the main San Joaquin River.

Tule River Power House

The Tule River Power House is located at the confluence of the Nelson and Doyle branches of the Tule River in Tulare county. The Doyle branch only is used, but it is proposed to use the Nelson branch, and some work has been done on the conduit line. Two 3000 kw. units have been installed with this use in mind. The head available is 1550 feet.



Interior of the Tule River Power House

Kern Canyon Power House

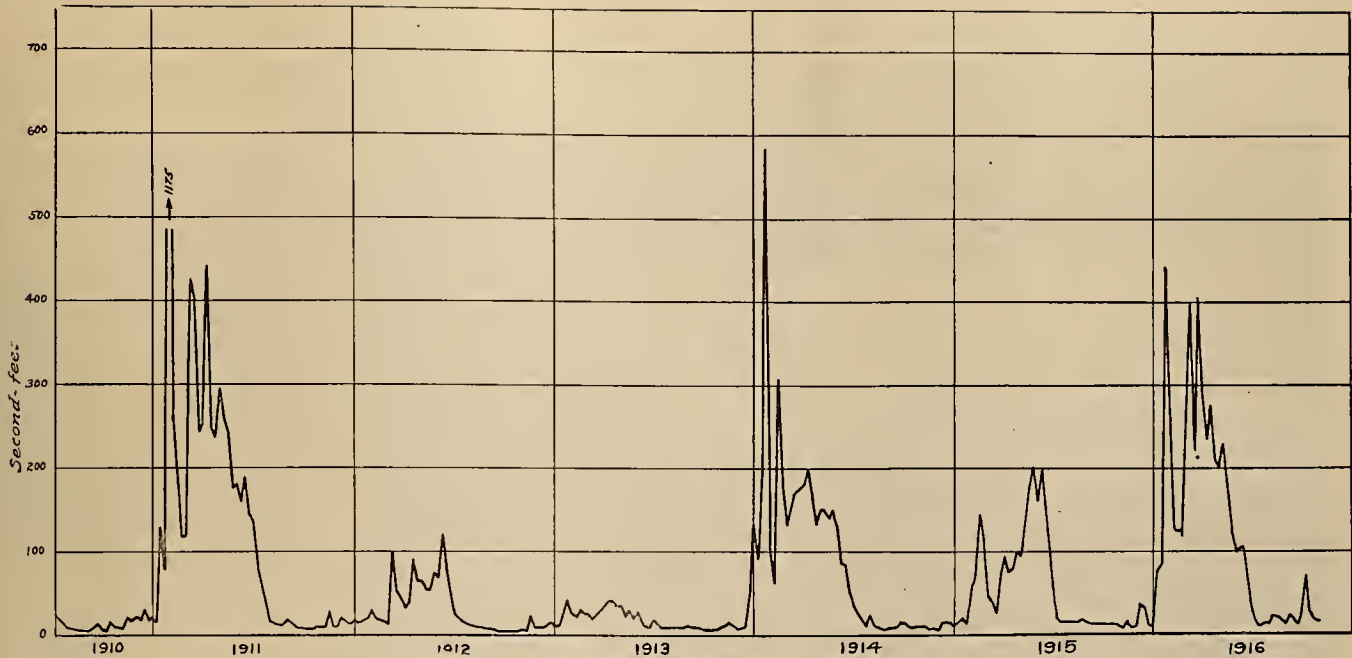
As far back as 1896, three 450 kw. units were installed on the Kern River in what is known as the Kern Canyon Power House. The machines have during the past year been replaced with a single 3750 kw. unit and it is the ultimate plan to rebuild the entire plant and increase the capacity to 7500 kw.

Merced Falls Power Plant

Still another power plant of this company is that known as the Merced Falls Power House, which uses



San Joaquin Power House No. 1, installed below the Crane Valley Dam



The carefully computed charts of precipitation kept for several years past now enable this utility to foretell with a remarkable degree of accuracy the possible hydro-electric supply that may be anticipated during these stirring days of war service in industry and agriculture for the approaching season.

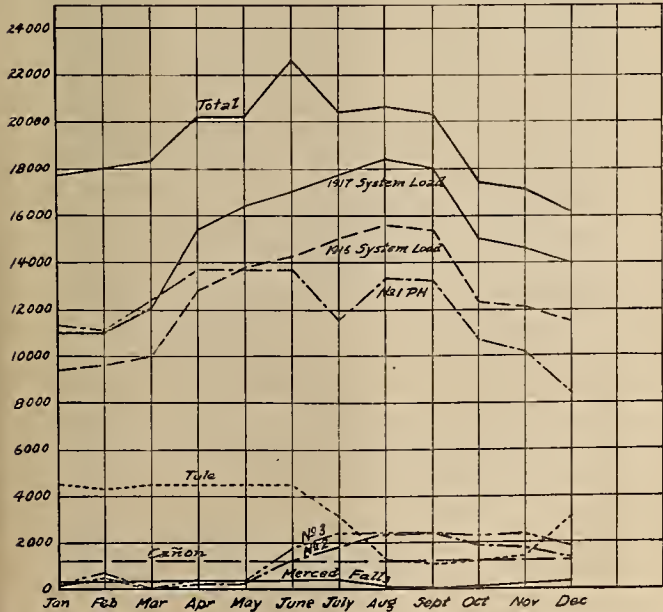
the waters of the Merced River after they emerge from the Yosemite National Park. The plant has two 225 kw. generators which are driven from a single water wheel.

Steam Auxiliary Plants

The Bakersfield steam plant is a modern steam turbine plant of 18,900 horsepower capacity, and there are reserve steam plants in Fresno and Betteravia, that have a combined capacity of 4290 horsepower.

Proposed New Developments

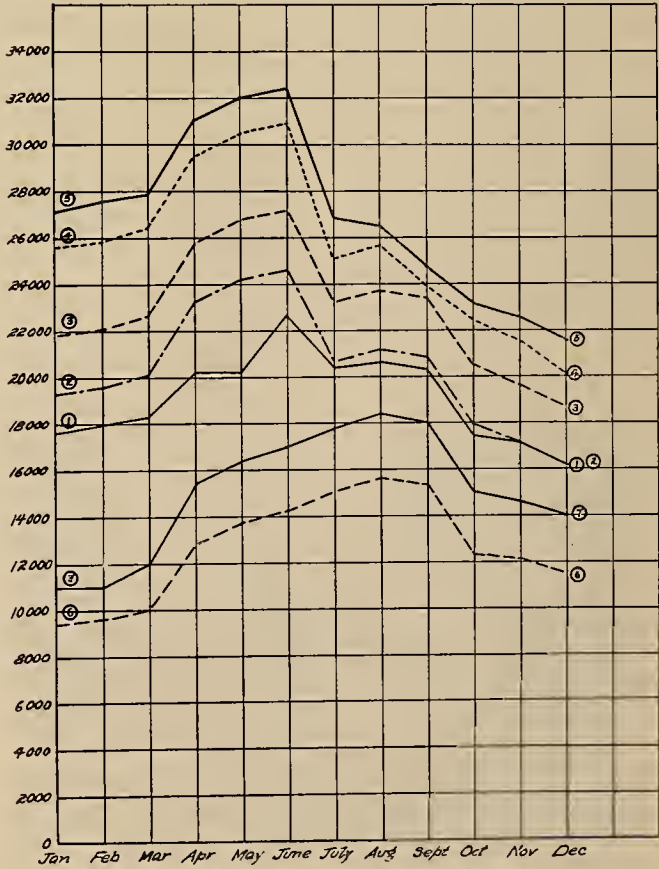
Power developments now under survey by this company aggregating in excess of 100,000 kilowatts capacity, and all power required for future needs of this territory is available in the Sierras bordering on the east.



POWER OUTPUT OF THE VARIOUS HYDRO-ELECTRIC UNITS Continuity of service is an important factor in war supply for industry and agriculture. Here is how the San Joaquin Light & Power Company receives its average load from its generating stations in the mountains.

How the Most Desirable Power Plant Operation Was Obtained

To show how war service of electrical energy has led the managers of this hydro-electric institution to develop the present and future capacity with utmost efficiency and the avoidance of waste effort, a discussion of the method pursued is interesting and timely.



POSSIBLE NEW DEVELOPMENT In recent stirring months of war service this company has made an intensive study looking toward additional hydro-electric supply. Much of this new development work indicated upon this sheet was installed during the past season.



THE CRANE VALLEY DAM

An earth and rock fill dam with a reinforced concrete corewall, has been constructed to store the waters of the north fork of the north fork of the San Joaquin river. The resulting 45,000 acre feet of storage will enable this company to perform a war service of priority of distribution during the coming season, should the power situation develop to such a critical state as to make this necessary.

In order to determine what load can be carried throughout the year on the hydro-electric plants of the system, with due consideration for additional developments, it was first necessary to make an extensive study of stream flow records over a long period of years. A period of at least five years, including at least one very dry year, was as a consequence determined upon.

How the Saving in Water Power Supply Is Effected

By a careful study of load curves it was found that the most economic saving of water supply is effected when the average monthly output from the power plants follows most nearly the present monthly output required, without calling upon the steam generating plants, and yet such an average monthly output as would give the largest available power supply during the summer irrigation season.

Having at hand the runoff that can be expected from the different streams, the next step was to determine the greatest average load that could be car-

ried per month on the present system for a year of normal runoff. For the Canyon, Merced Falls, and Tule plants, the load corresponds to the stream flow for the particular month, as shown on the curves for stream flow.



A TYPICAL SUBSTATION IN THE SAN JOAQUIN VALLEY

Here is the manner in which power is taken to the great out-doors in the San Joaquin Valley of California, where some five million acres of cultivatable land may ultimately be served by this company.



THE TULE RIVER POWER HOUSE

This plant, too, may be termed a war baby, in that it was thrown into service after the European struggle was initiated in 1914. Two 3000 kw. units are installed which utilize waters of the Tule River from a 1550-foot vertical drop.

The illustration shows graphically the total power curves, together with the load each station carries to give this total. There is also shown the 1916 system load curve and the assumed 1917 system load curve. The values are in kilowatts and represent the average load that can be carried.

A Remarkable Growth in Load Factor

Perhaps the most remarkable outstanding feature of the war service developments in the power situation of the San Joaquin Light & Power Corporation is the high load factor with which its power supply is maintained. In most communities of the West where the irrigation pumping load plays such an important

part, the load factor is very low. Here is a company, on the other hand, that has during the past year operated as high a load factor as 81.8%. But in the strenuous months ahead it is confidently expected that the load factor will be carried as high as 85%. Such distribution of load is indeed true war service to the nation..

In order to get a comprehensive grasp of just how the hydro-electric and steam electric generation is proportioned in this interesting system, the accompanying chart for total output is given in full. This chart gives the monthly operating figures for 1916 and 1917, and also sets forth a proposed chart for the present year.

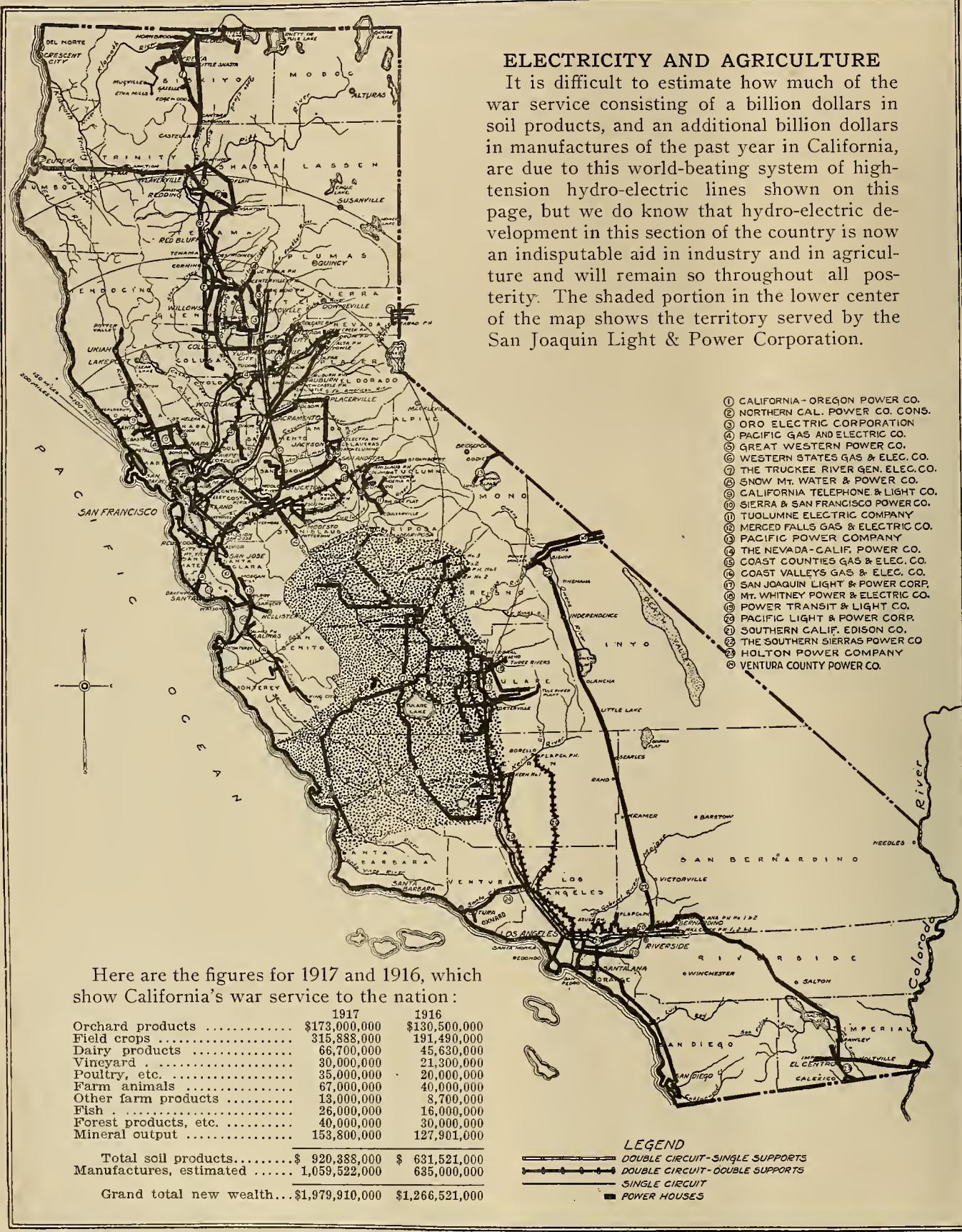
SAN JOAQUIN LIGHT AND POWER CORPORATION
TOTAL OUTPUT BY MONTHS—1916-1918—HYDRO AND STEAM

	System Total Kilowatt Hours	Hydro Kilowatt Hours	Steam Kilowatt Hours	Barrels Fuel Oil Used	System Peak	Load Factor
1916—						
January	7,008,738	6,927,820	80,918	1,910	14,900	63
February	6,676,500	6,616,036	60,464	1,924	13,800	69.5
March	7,405,430	7,249,930	155,500	2,120	14,300	67.2
April	9,182,624	9,176,074	6,550	803	18,900	67.5
May	10,202,504	10,189,908	12,596	1,095	18,000	76.2
June	10,236,902	10,226,642	10,260	961	18,400	77.5
July	11,133,438	11,120,428	13,010	1,136	19,800	75.9
August	11,611,358	11,467,818	143,540	2,940	20,350	76.6
September	11,039,472	10,613,782	425,690	5,067	20,800	73.8
October	9,139,624	8,718,294	421,330	5,780	18,600	66
November	8,711,550	8,395,480	316,070	4,206	18,600	65
December	8,572,754	8,362,054	210,700	4,313	17,600	65.4
Total	110,920,894	109,051,666	1,869,228	32,255		
1917—						
January	8,225,444	8,208,444	17,000	2,104	16,500	67
February	7,348,108	7,343,408	4,700	1,658	15,500	70.5
March	9,034,278	8,947,278	87,000	2,448	18,500	65.6
April	11,079,996	11,036,396	43,600	2,074	21,100	72.9
May	13,116,920	13,043,920	73,000	2,748	23,000	76.6
June	13,252,980	12,407,980	845,000	6,291	23,600	77.9
July	14,756,882	13,768,182	988,700	7,150	24,500	80.9
August	15,219,458	12,854,458	2,365,000	15,312	25,000	81.8
September	14,288,092	11,590,092	2,698,000	17,758	25,100	79.2
October	13,600,000	10,994,000	2,606,000	16,350	25,000	73.4
November	12,800,000	11,760,000	1,040,000	6,970	23,500	72.5
December	12,500,000	11,565,000	935,000	6,180	22,000	73
Total	145,222,158	133,519,158	11,703,000	87,043		
1918—		Economic Possible Hydro Output	Necessary Steam			
January	9,442,150	13,850,000	.....	2,000	17,900	71
February	8,019,716	9,678,000	.....	2,000	16,700	71.5
March	10,663,126	15,319,400	.....	2,000	21,400	67
April	12,977,368	14,817,000	.....	2,000	24,050	75
May	16,031,336	18,420,000	.....	2,000	28,000	77
June	16,268,058	18,209,500	.....	2,000	28,600	79
July	18,380,326	16,981,800	1,398,526	8,226	29,100	85
August	18,827,558	14,639,200	4,188,358	24,598	29,800	85
September	17,536,712	13,671,000	3,865,712	22,740	29,000	84
October	18,060,376	14,372,400	3,687,976	21,694	30,400	80
November	16,888,450	14,312,000	2,576,450	15,155	29,700	79
December	16,427,246	16,409,800	17,446	2,000	27,600	80
Total	179,522,422	180,680,100	15,734,468	106,413		

TRANSMISSION SYSTEMS OF CALIFORNIA

ELECTRICITY AND AGRICULTURE

It is difficult to estimate how much of the war service consisting of a billion dollars in soil products, and an additional billion dollars in manufactures of the past year in California, are due to this world-beating system of high-tension hydro-electric lines shown on this page, but we do know that hydro-electric development in this section of the country is now an indisputable aid in industry and in agriculture and will remain so throughout all posterity. The shaded portion in the lower center of the map shows the territory served by the San Joaquin Light & Power Corporation.





THE PRODUCT OF THE DESERT BEFORE THE ADVENT OF ELECTRICITY

Here is a view of the desert, studded with the famous Spanish yucca—a picturesque growth in agriculture, but hardly a war-time necessity. In subsequent pages the reader may note the marvel that electricity has wrought in the present production of lands similar in character to that shown above.

WAR SERVICE IN AGRICULTURE



The rattlesnake, the inhabitant of the desert before electricity's advent.

AGRICULTURAL products before the advent of the electrically operated pump, in many parts of the great San Joaquin Valley, consisted largely of the yucca tree and the rattlesnake. Today the transmission lines of the San Joaquin Light & Power Corporation serve thrifty and profitable districts that are wonderfully productive. The success of this company

exemplifies to a marked degree what must be the ultimate outcome of a policy of optimism and confidence in a growing and promising community. Five years ago, for instance, an extension of the company's lines was undertaken from Bakersfield northward for a distance of 31 miles to Wasco, through a country that would make many a faint-hearted man wonder if returns would ever justify the outlay. The sole inducement that this company had was a 125 horsepower pumping contract. Today the result of this farsighted policy is simply marvelous. Hundreds upon hundreds of acres of productive farm lands are fed from this extension, and needless to say that the load in electrical-ly operated pumps has increased by leaps and bounds. Many of the illustrations shown on succeeding pages setting forth agricultural production in potatoes, wheat, rice, citrus fruits, wool, hogs, cattle, corn—necessary war food stuffs—are taken from this district.

This company, following the policy of building into wild and untilled territory, needing water alone to make it productive, has in these recent months completely justified these great outlays of five years ago. As a consequence, its load factor approaching near the 85% mark, stands out as unique in hydro-electric development.

Statistics from the Chamber of Commerce of Kern County, in which the Wasco extension is located, give emphatic evidence of this growing use of electrical energy and the splendid war service that has been rendered during the past year. Thus, during the past year, the acreage planted to corn has been increased to 25,000 as against 16,000 in 1916; in potatoes the acreage has increased to 1200 as compared with 300 in 1916, while wheat and barley have increased by over 3000 acres in the past year.

Four years ago, rice for the first time was planted. As an experiment two acres were devoted to this product. This year this county expects to ship 72 cars of the finished product. The first sugar beets were planted in the county in 1914. This year this district harvested 6000 acres. Beans, another new crop in this district, is proving a revenue producer for the farmer, as is the alfalfa, the dairy and the hog industry. The alfalfa, of which the district has close to 100,000 acres, has made rapid strides, under the pump system, which has indeed been a welcome adjunct to agriculture.

But this is only a statement of one small part of the great territory served by the San Joaquin Light & Power Corporation. The entire territory served constitutes an empire of five million acres of cultivatable land—an empire vast and overflowing with possibilities for future intensive development.

Electricity the Pioneer

Where the great power lines stretch across the desert—is the promise of tomorrow. First power, then water, then corn and beans and pork and sugar beets to feed the world. Day by day, served by the power from these thread-like wires, the acres are being reclaimed from desolation to service—war service—and beyond that, a permanent gain to the storehouses of the world.



Electrically Made Pipe

Not only does electricity help to pump the water from the great underground storage of the San Joaquin basin, but it helps to make the pipe through which to conduct it onto the land. An electrically run factory near Henrietta is turning out literally miles of pipe which is to extend through a vast area and bring 50,000 acres of arid land to production.



The Begining of a Farm

A little house, a shed, an electrically driven pump—just a dot upon the desert. But it is just such beginnings as these which have made possible the 50 per cent increase in output for 1917 which is the boast of California's agriculture. Every acre put under cultivation is clear gain, from the harnessing of water power otherwise run to waste, to the forcing back of the desert frontier.



Plowing Virgin Soil

In Kern county alone, the use of electric pumps made possible the increase of corn acreage from 16,000 in 1916, to 25,000 in 1917; of potatoes from 300 to 1200; wheat and barley acreage in this county have increased 3000 over the year before the war. The stretch of dark soil extending into the distance across the back of the picture shows the new plowed desert ready for the lifegiving water.



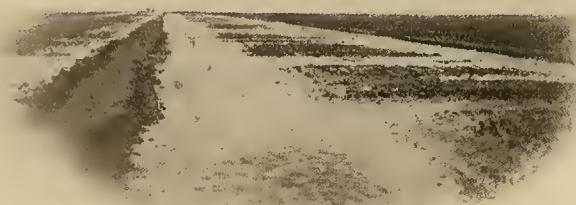
Storing Water in the Night

To get the full benefit of the pumping plant, the farmer provides a small reservoir to store the water pumped during the night. An idea of the difference in the problems of the farmer of the West and of the East is glimpsed here. For your Western rancher must not only be a good agriculturist, but something of an engineer and electrician as well. The picture shows a windmill, a gas engine and an electric pump installed—with electricity winning out.



Water Pumped by Water Power

The power from the mountain waterfalls furnishes electric energy, then lower in the valleys sinks into the sands to form a great underground reservoir beneath the San Joaquin country. And here, by way of compensation, the electrically driven pumps lift it to the surface and pour it out upon the fertile soil. Perhaps nowhere else in the world is the service of electricity to food production so essential as in this growing Western territory.





THE PROMISE FULFILLED

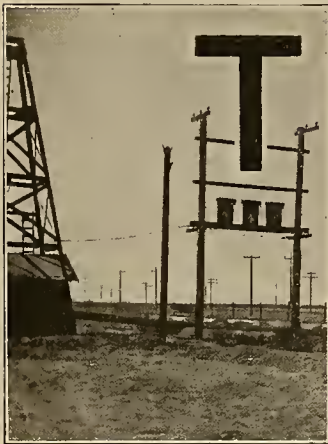
First a power line out into the desert—in one instance the San Joaquin Light & Power Corporation built 31 miles to connect up 125 horsepower—then a pump and an irrigating system and the first shoots of green—finally, this garden stretch of miles and miles of the most fertile country in the world. The country shown in these two views was originally barren desert land like that on the preceding page. Today, under proper irrigation, it is furnishing hundreds of millions of dollars worth of food products every year. In the steady conquest of the desert, in the phenomenal increase of production made possible by this irrigation, electricity's war service in the interest of agriculture is to be found. And back of all this stands a permanent gain in prosperity for the country—from rich farms the impulse passes on to growing communities, transportation, manufactures, and back to increased needs for electricity in factory and home.





The rock crusher for road building, electrically operated.

WAR SERVICE IN ROAD BUILDING



The out-door transformers for oil pumping and highway construction.

In addition to this, the various counties of the commonwealth have augmented the outlay for further exten-

THE great highways, the arteries of California, now world famous as scenic wonders, are today rendering an indisputable service in conveying the products of agriculture and industry to the markets of the world in supplying the needs of the nations at war in defense of democracy.

Thirty-three million dollars have been appropriated by the citizens of the state for the building of these highways. In addition to this, the various counties of the commonwealth have augmented the outlay for further exten-

sions within their respective confines. Kern county, for instance, has expended an additional two and one-half millions for its highways. How electricity is aiding in this service may be gathered from the views



A concrete bridge in Kern County

shown on this page. First, the rock crusher, electrically operated, then the out-door transformer for ready use in the mixing of concrete along the road under construction, and finally the completed highway—a most useful institution in these strenuous times, and yet a joy to the people of the community throughout all posterity.

SOME STATISTICS OF THE WORK

Miles of road surveyed.....	2280
Miles of Right of Way secured.....	1705
Acres of Right of Way secured.....	13327
Miles of Highway constructed:	
Oiled Macadam	129
Concrete Pavement	933
Asphalt	33
Graded	395
Total.....	1490



A typical highway in California—a beautiful creation, yet a creation that is rendering eminent war-time service.



AN ALFALFA SHEEP PASTURE

These are the sheep that feed on the alfalfa that is raised on the land that is watered by the help of electrically driven pumps—and the nation is looking to them to furnish a major portion of its food supply. \$300,000 worth of lambs and mutton, to say nothing of some \$200,000 worth of wool, is the record of one county alone in this particular region.



And then electricity provides the power to do the shearing.

PROFIT IN PIGS

Just to show what can be done with pigs on irrigated land—in 1912, a Kern county farmer invested \$330 in 12 sows and a boar. At the end of two years, subtracting all expenses for food and labor, his profit was exactly \$2032.70, or something over 600 per cent on his original investment. And electricity pumped the water that grew the grain and alfalfa which was fed them. For further particulars on this remarkable industry, the reader is referred to the secretary of the Board of Trade, at Bakersfield, California.



SPINELESS CACTUS FOR FODDER

Perhaps the most natural product for the newly salvaged soil is spineless cactus, which provides excellent fodder for the livestock of the farm.

IRRIGATION AND THE DAIRY INDUSTRY

Irrigation has played a most important part in the development of the dairy industry in California, as is shown by the census reports. Electricity in the pumping of water, the milking of cows and many other uses about the farm, is becoming indispensable. Many of the now leading dairy counties in the State were twenty-five years ago immense wheat fields, but with the coming of irrigation and intensive agriculture this condition has been materially changed. Statistics for 1917 are not yet available, but a glance at the two previous years will give an indication of its value to the commonwealth in the statement below setting forth the counties of the state that have produced over one million pounds of butter fat per year.

Counties—	1915	1916
Butte	1,124,710	2,073,297
Fresno	3,158,220	4,204,416
Glenn	1,258,020	1,725,746
Humboldt*	5,591,870	5,588,604
Imperial	6,334,316	6,780,552
Kings	3,811,477	3,960,949
Marin	2,338,338	2,475,329
Merced	4,253,000	4,028,062
Sacramento	1,737,511	1,422,051
San Joaquin	1,184,658	1,618,455
San Luis Obispo	2,759,751	2,303,547
Sonoma*	2,965,893	3,071,474
Stanislaus	9,973,320	9,980,021
Sutter	969,594	1,048,270
Tulare	4,787,690	4,677,339
Yolo	1,091,496	1,241,083

*Non-irrigated.

RICE FROM THE SAN JOAQUIN VALLEY

Here is a new agricultural war industry of California—the raising of rice. For this purpose land absolutely unavailable for anything else, often subject to alkali, is used to a great extent. The flat lands of Tulare county offer new and promising opportunities for war service of this nature, as well as the addition of a valuable permanent asset to this section. Although this was an unknown product in Kern county two years ago, the past season has seen a shipment from this district of over 72 carloads of the finished product, grown under irrigation brought about by electrically operated pumps.



The cattle are fed on electrically irrigated alfalfa and milked by electricity



The new rice fields of California

FODDER CORN

The first year after irrigation produces a bumper crop of corn or alfalfa or potatoes, as the case may be. Some 37,000 bushels of corn and an equal amount of kaf-fir corn and maize were grown in 1916 in Fresno county — and the year of war demand has brought an increase of something like 50 per cent in acreage.

**MILES OF POTATOES**

\$151.40 was realized from every acre of this vast potato field and then the ground was ready for the next crop. Some five crops of alfalfa are obtained in a year as well as double crops of many other food products. The maintenance of this vast area at full production capacity is one of the constructive services of the war.

THE CORCORAN GRAIN WAREHOUSE

Carloads of war service in much-needed grain, all from irrigated farms where water is pumped electrically from Lake Tulare, formerly the second largest fresh water lake in the United States, but today gradually receding due to intensive use of its water in irrigation.





Deciduous fruits in the harvesting

Grapes and Raisins

The power lines of the San Joaquin Light & Power Company serve 80% of the grape and raisin industry of California. On the other hand, California is the most important factor in viticulture in the United States. It has over 90,000,000 vines, more than all the rest of the states in the Union. It represents an investment of \$150,000,000, which returns an annual income to the grower of over \$20,000,000. Over 100,000 people are dependent upon California's viticultural industry. This includes 15,000 heads of families that own vineyards, 700 wine-makers, and the laborers who do the picking and hauling, besides those employed in the wineries and those engaged in cultivating and handling our raisin and table grapes.



Preparing for the making of "Sun-Kist" raisins

Deciduous Fruits

Deciduous fruits — apricots, peaches, pears, plums — are of increasing importance as food stuffs for war service. In 1917 California produced \$173,000,000 in orchard products, as compared with \$130,500,000 in 1916.

The soil of the immense agricultural district served by the San Joaquin Light & Power Corporation is as varied as its production. It is a well-accepted fact that arid and semi-arid lands are rich in plant food. The chemical elements have not been washed out by excessive rains and the soil has been aerated by a long series of cloudless summers. Throw up the soil a short distance below the surface and it is found to be productive at once. It does not have to be "weathered" as in the cold and rainy regions.



Drying the product for war foodstuffs

WAR SERVICE OF ELECTRICAL ENERGY IN THE MINES

The mineral output of California for the year just closed amounted to a valuation of \$173,000,000, as opposed to \$127,901,610 in 1916. In the district served by the San Joaquin Light & Power Corporation the enormous production of crude petroleum is of marked value at this period. The war service of electrical energy in the oil fields is tersely summarized in the four concluding pages of this article. At this point it is well to acquaint the reader with some of the other products of the mines in order to form a proper value of their importance for war service.

In the illustration below is shown the mining district of Randsburg, where tungsten deposits are mined—a product that is of great value in munitions manufacture. Some five millions of dollars in tungsten ores were mined in California during the past year.

Tungsten mining was active in several districts, especially in Kern and Inyo. The discovery of a large tungsten belt near Bishop attracted much attention that culminated in the development of several excellent producers and the erection of four plants.

The outstanding feature of the year was the intensified search for chrome, manganese, platinum and the rarer metals. Never before has the seeking been so determined or carefully conducted. High prices, brought about by the war, stimulated prospecting for minerals previously considered hardly worth the hunting. Rejuvenation of hundreds of old-time producers and discovery of new metal yielders in all sections of the state insures a tremendously increased output in 1918, particularly copper, silver, lead, zinc, quicksilver, many of the rare metals, and possibly gold. And in

all this intensive search for new metals electricity is now recognized as an important aid.

California is still the premier state in gold production and the electrically operated gold dredge has during the past year advanced to high planes of efficiency, breaking all records established in other commonwealths of the United States. Her production of gold for 1917 was about twenty-two million dollars. The gold dredges operated in the district served by the San Joaquin Light & Power Corporation continued their accustomed yield for the year.

The gold production for California, since its discovery in 1848, has amounted to a billion and two-thirds dollars. In recent years the electrically operated dredge has produced the major portion of the output. Here is the yearly production for the past ten years:

1907	.....	\$16,727,920
1908	.....	18,761,559
1909	.....	20,237,870
1910	.....	19,715,440
1911	.....	19,738,908
1912	.....	19,713,478
1913	.....	20,406,958
1914	.....	20,653,496
1915	.....	22,442,296
1916	.....	21,410,741

Value of Other Mineral Products		
Substance—	1915	1916
Borax	\$1,663,521	\$1,670,000
Brick	1,678,756	1,600,000
Cement	6,044,950	6,100,000
Clay — Pottery	133,724	135,000
Lead	225,426	1,000,000
Lime	286,304	285,000
Limestone	156,288	155,000
Magnesite	283,461	800,000
Mineral water	467,738	470,000
Natural gas	1,706,480	1,800,000
Pyrite	293,148	295,000
Quicksilver	1,157,449	2,500,000
Salt	368,737	350,000
Silver	851,129	1,400,000
Stone, miscellaneous	5,011,108	5,100,000
Zinc	1,617,383	2,000,000



The tungsten mines at Randsburg



1 2,3 4. 5,6 7,18,8,15, 9,

PANORAMIC VIEW OF THE

- 1—Standard Oil Company reservoir farm on plains just to left of picture. Derricks in distance are discovery wells in the new west front territory of the Kern River field now being opened up by the Standard and Associated Oil Companies.
- 2—Headquarters Standard Oil Company pipe line division. This is starting point of pipe line which carries oil from this field to Point Richmond refinery.
- 3—Standard Oil Company earthen reservoirs.
- 4—Standard Oil Company, Bakersfield district refinery.
- 5—Standard Oil Company steel tank farm.
- 6—Producers' Transportation Company headquarters, pipe line station and reservoirs—beginning of pipe line handling oil for Union Oil Company and Independent Oil Producers Agency. Terminal, Port San Luis.
- 7—Union Oil Company refinery recently destroyed by fire. Now in process of rebuilding and will be electrically equipped and operated throughout.
- 8—Associated Pipe Line Company station, beginning of line terminating at Port Costa.
- 9—Oil Center, location of field headquarters of Associated Oil Company. Main field offices, shops and residences.
- 10—Railroad loading racks for transportation of oil.
- 11—Headquarters and main field offices of Kern River Oilfields, Limited, the English corporation which purchased properties of 33 and Imperial Oil Companies.
- 12—Headquarters and field offices Kern Trading and Oil Company, now known as Fuel Oil Department, Southern Pacific Company.
- 13—Headquarters and field offices The Petroleum Development Company, oil producing department of the Santa Fe Railway System.
- 14—Location of original discovery well just around bend in river.

PRODUCTION OF FUEL OIL



Not a Victrola record, but one of the power plant district managers looking through a pipe in the oil fields.

RELIMINARY estimates by John D. Northrop of the United States Geological Survey, Department of the Interior, indicate that the quantity of petroleum produced and marketed in the oil fields of the United States in 1917 reached the record-breaking total of 341,800,000 barrels, a quantity nearly 14 per cent greater than the former record output of 300,767,158 barrels, established in 1916. California's fields were the second largest of all sources

The production is apportioned among the major fields as follows:

Field—	Barrels. 1916	Barrels. 1917
Appalachian	23,009,455	24,600,000
Lima-Indiana	3,905,003	3,500,000
Illinois	17,714,235	15,900,000
Oklahoma-Kansas	115,809,792	147,000,000
Central and N. Texas.....	9,303,005	11,000,000
North Louisiana	11,821,642	8,700,000
Gulf Coast	21,768,096	24,900,000
Rocky Mountain	6,476,289	9,200,000
California	90,951,936	97,000,000
Other Fields	7,705	.....
Totals	300,767,158	341,800,000

The salient features of the industry in 1917 were the record levels reached and firmly maintained by

prices of crude oil at the wells and the enormous demand which absorbed not only the current output of the wells, but necessitated a net draft of about 21,-000,000 barrels on oil in storage, principally in California and Illinois. The surface reserve of crude oil in the United States at the end of 1917 is estimated at 153,000,000 barrels.

The principal sources of new production in 1917 were Estill county, Ky.; Butler county, Kan.; Carter county, Okla.; Wichita and Harris counties, Texas; Converse county, Wyo.; and Los Angeles county, Cal.

Petroleum comes fourth in the West, according to these statistics, as a most valuable asset in natural wealth of the nation. But the salient feature of war-time service in the oil fields is the vast increase in the use of hydro-electric energy in the drilling of new wells and in the pumping of the oil itself.

In past years California's production has been as follows:

Year	Barrels	Year	Barrels
1875	175,000	1898	2,249,088
1876	12,000	1899	2,677,875
1877	13,000	1900	4,319,950
1878	15,227	1901	7,710,315
1879	19,858	1902	14,356,910
1880	40,552	1903	24,340,839
1881	99,862	1904	29,736,003
1882	128,636	1905	34,275,701
1883	142,857	1906	32,624,000
1884	262,000	1907	40,311,171
1885	325,000	1908	48,306,910
1886	377,145	1909	58,191,723
1887	678,572	1910	77,697,568
1888	690,333	1911	84,648,157
1889	303,200	1912	89,689,250
1890	307,360	1913	98,494,532
1891	323,600	1914	102,881,90
1892	385,049	1915	91,146,620
1893	470,179	1916	90,262,557
1894	783,078	1917	97,000,000
1895	1,245,339		
1896	1,257,780		
1897	1,911,569		
		Total	1,040,888,292



11.

12, 16.

13, 14, 17

KERN OIL FIELDS

15—Catch basin for holding waste oil and water to prevent same from flowing into Kern River, waters of which are used for irrigating hundreds of thousands of acres of agricultural lands. Tremendous damage would result were oil to get into the river and be carried onto lower farming lands.

16—Another catch basin.

17—China Grade, the county road leading into the oilfield over the bluffs—one of the main traveled highways.

18—Southern Pacific Company branch railway line serving the oilfield just to rear of picture.

THE GROWTH OF NEW INDUSTRIES

Along with all the increase in agricultural production set forth in the preceding pages, the advent of hydro-electric service has also seen the building of many new industries. To care for the agricultural product alone an empirical formula seems to have developed whereby it may be roughly estimated that for every horsepower of installation in the rural community for agricultural purposes, at least one-third as much power springs up in new manufacturing to care for this product—manufactories consisting of dairying, fruit preserving, rice threshing, canneries and the like. Not alone is this section growing industrially due to this cause, however, for recent statistics show that the freedom of country life and environment for the workers is leading the larger industrial centers to consider with ever increasing favorable light the establishing of future extensions in such districts as are being built up under conditions of ideal service and open-air life, such as those presented in the San Joaquin Valley.

But the major industry of this section is to be found in the oil fields which are now being so rapidly changed over to electrical operation. As to how this increasing electrical load,



A LAKEVIEW GUSHER

The electrical pumping of oil is but one of the modern methods of economy which are helping to preserve the store. A 10,000 "barrels daily" gusher was tapped recently by the Standard Oil Company, and not a drop lost.

which today consists of over 2000 wells electrically operated, is rendering a war service in the saving of oil that would otherwise be consumed in the pumping of this product, the reader will find conclusive evidence by scanning the pictures and noting the emphatic points brought out.

War Service in the Pumping of Oil

Electricity in the oil fields saves men, material, and fuel—three essentials in helping to meet the present international crisis. Considerable investigation into comparative costs of oil-well pumping by various methods has been undertaken during recent months, the results of which show very favorably for the method electrical. S. G. Gassaway, in the General Electric Review for August, 1917, makes a detailed comparison of pumping by electric motors, when power is purchased at 1 cent per kw. hr., electric motors with power generated by steam turbines, gas engines, electric motors with power generated by gas engines and steam engines at wells, including boiler plants burning oil. After careful analysis for a given installation, the following figures are given:

Cost of Oil Well Pumping

	Cost Equipment at Wells.	Cost Power Sta. Equipment.	Yearly Operat- ing Cost.
Electric motors, power purchased at 1 cent kilowatt hour.....	\$60,900.00	.....	\$43,707.00
Electric motors, power generated by steam turbines	60,900.00	\$58,800.00	49,647.00
Gas engines	85,500.00	.....	53,265.00
Electric motors, power generated by gas engines	60,900.00	74,500.00	58,879.00
Steam engines at wells, including boiler plants burning oil.....	69,800.00	.....	152,182.00

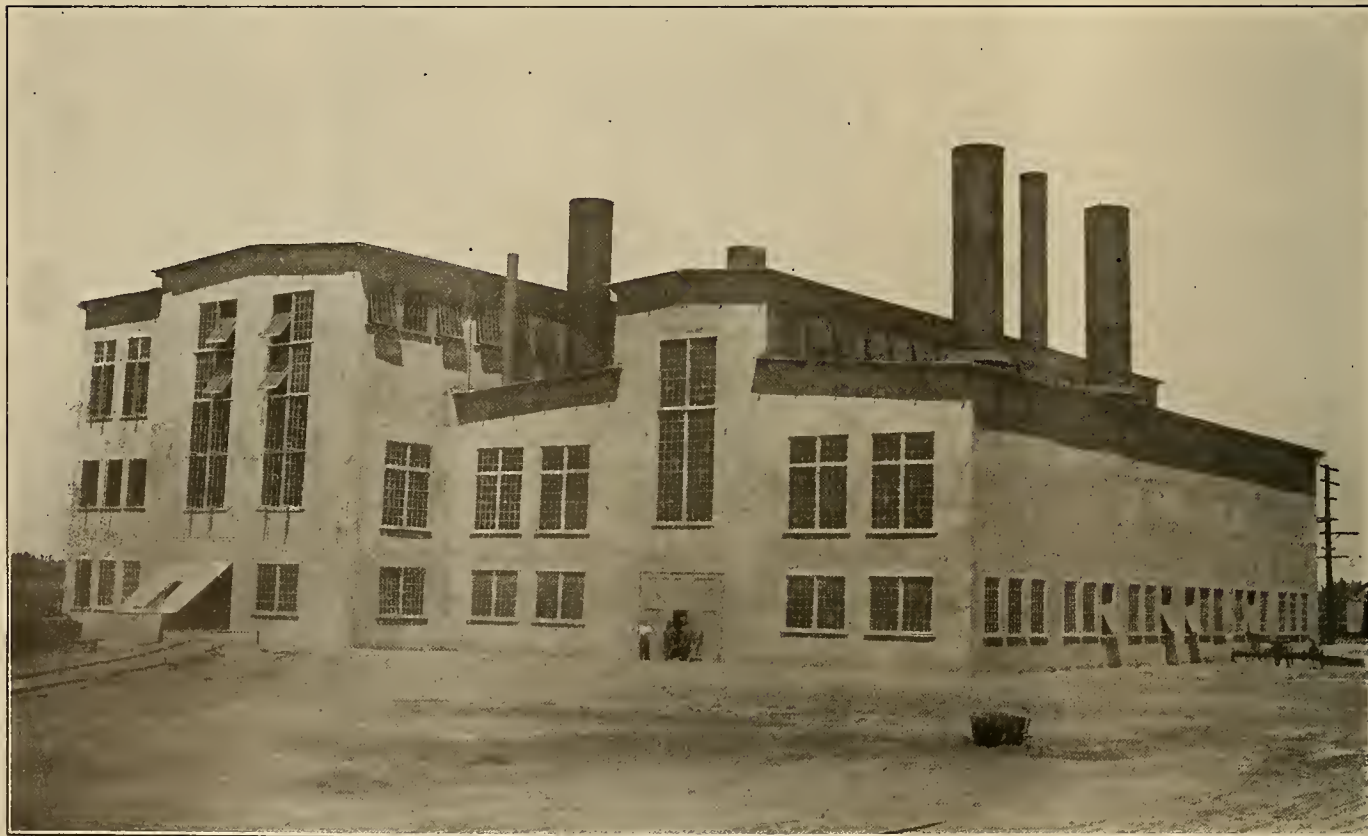
Thus it is seen that the electric drive is far superior from a financial viewpoint.

There are something over 2000 electrically operated oil wells that have been operating for periods of from 1 to 11 years, in which the repair expense has not equalled 1 per cent of the first cost. Likewise, there are several hundred gas engine wells which have operated not more than 4 or 5 years, in which the maintenance exceeds 11 per cent.

When electric motors were first put in the oil fields the designing engineers had many problems to solve. Today, however, an excellent design has been put forth that meets admirably the unusual conditions experienced in this type of installation.

A decided advantage in motor drive for the pumping of oil is the very steady motion imparted to the beam and in the fact that the number of strokes when once set on the controller will remain the same year in and year out until the controller is set at some other speed. The motor does not pick up the rods with a jerk, as in the case of steam and gas engines, the speed of the band-wheel being practically constant for the entire revolution. The rods, therefore, are less liable to crystallize with resulting breakage, causing shutdown due to rod troubles.

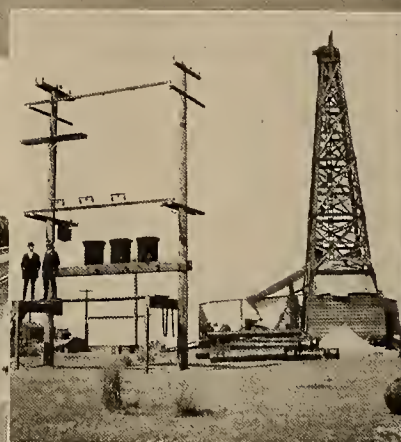
But best of all, the real war-time service that electrical energy is today rendering in the oil fields is the fact that the oil product itself, so needed in driving our merchant marine and in other fields of industry, is thus replaced by that subtle force electricity, generated from a never-failing source—the snow-clad Sierras a hundred miles away.



THE USE OF NATURAL GAS IN ELECTRIC GENERATION

Where steam-electric generation has been necessary as an auxiliary to hydro-electric generation, fuel oil is used exclusively in California for this purpose. The San Joaquin Light & Power Corporation however, is planning to initiate a new war service in the conservation of fuel oil, by the early introduction of natural gas as a fuel for its steam electric plant at Bakersfield, California. Assuming

that a barrel of oil generates on the average of 170 kw. hr. of electric energy, it is estimated that the season of 1918 will see a saving of over a hundred thousand barrels of oil from this source alone. To accomplish this, six hundred million cubic feet of natural gas will be required—gas that is now being put to no useful purpose in the oil fields. Such service as this is true conservation.



WAR SERVICE IN THE OIL FIELDS

By a close examination of the several views shown above, one may conceive some idea as to how California's 97,000,000 barrels of crude petroleum were last year moved to market. First, the oil is taken from its natural haunts below the earth's surface by means of pumps operating within the derricks shown in the first view, which is that of Taft, California. Next, the oil product is taken from the temporary lakes created from the output of the pumps, and either loaded into cars or in storage tanks. Electricity serves in all these

operations, and in one of the views given the reader will note the out-door transformer station serving the oil well to the right. The various methods shown above indicate only one means of transportation. The largest part of the oil, however, is pumped directly to the seaports through pipe lines which are being operated at the present time to the full capacity, to facilitate railroads in coping with car shortage.

ASTORIA UNDERGROUND ELECTRICAL SYSTEM

BY R. J. DAVIDSON

(To prevent the unsightly wiring necessary to meet the needs of a growing community, many of our cities are requiring underground distributing systems. The way such a system is planned and carried out, and the difficulties overcome without too large an expenditure, is described in this interesting article. The author is with the Pacific Power and Light Company of Portland, Ore.—The Editor.)

The Pacific Power & Light Company has recently completed an underground electrical distributing system for power and lighting service at Astoria, Oregon, that is somewhat out of the ordinary, due to the unique street construction.

A brief resume of the conditions obtaining at Astoria is not amiss as an introduction to the description of the system. The present estimated population of Astoria is 17,000. The city is situated on a tongue of land lying between the Columbia River on the north and Young's River on the south, with the principal residence section and all of the business section on the north side and facing the Columbia River. A ridge runs the length of the peninsula with rather a steep slope up from the north. The residence section occupies this hillside and forces the business section to the river front. As the city grew this section extended out further and further until it reached a width of about four blocks in which the streets and buildings were supported on piling over the water. It was necessary to replace this piling and also the planked streets every few years, and it soon became an expensive foundation for a business district. There was also the inconvenience of having no basement space or sewerage system.

Early in 1914 the city created a Sanitary and Reclamation Commission, with power to better conditions. A rock sea wall was built along the outer edge of the business district the entire length of the water front, and sand was pumped in from the river, making a fill under the business district about 11 feet in depth and extending some two or three feet above the high tide level. The street grades in this district were raised about $4\frac{1}{2}$ feet to a new level averaging about $9\frac{1}{2}$ feet above the surface of the sand fill. This

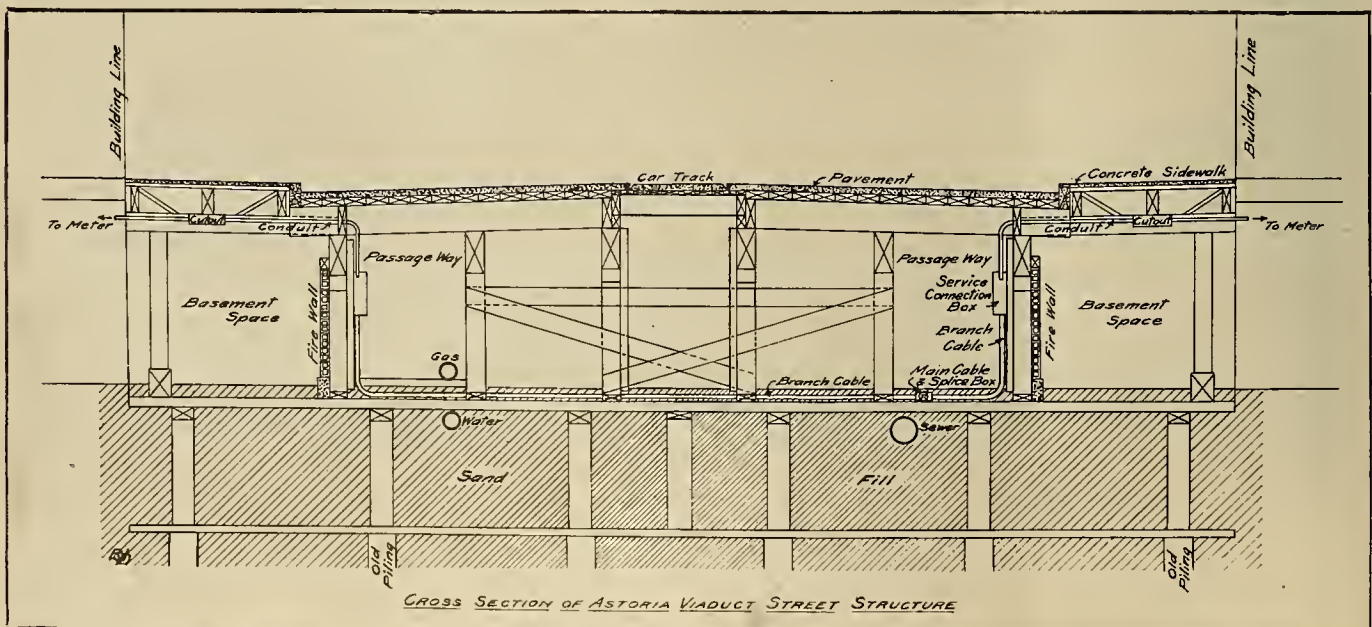
necessitated raising practically every building in the business district.

The accompanying sketch shows a cross section of the completed street. The old piling was cut off below the surface of the sand fill and, with caps and stringers, constitutes the foundation for the street-supporting structure. Eight rows of posts run the length of the street. The rows nearest the property line support the sidewalks and have no bracing to interfere with the basement space under the sidewalk. The next adjoining rows have bracing running lengthwise of the street, and along these rows run tile walls which are called the "fire-walls." The four rows of posts supporting the central portion of the street are braced among themselves in both directions. This construction allows a passageway on either side adjoining the firewall, and in these passageways are located the various utility systems. The approximate length of this construction is one mile.

The city installed the sewerage and water systems, which are buried in the sand, one on either side of the street. The telegraph and telephone companies installed their circuits with bracket construction and cables supported from the viaduct framework. The gas distributing system, installed by the Pacific Power & Light Company, is ideal in that the mains are not buried but are carried on supports slightly above the sand level, and all connections, valves, services, etc., are in plain sight. Coated and wrapped steel pipe with patented couplings are used.

The electric system presented the greatest problem, as it is well known that underground electric construction quickly runs into money.

The height of the old street surface above the solid ground made it necessary to use 60-foot to 70-foot



poles for supporting the electric light and power circuits. As a consequence, practically all of the lines were routed through the main streets where the heaviest loads were located, and, as the city grew, the number of wires increased until there was a veritable network of overhead construction, and to this, of course, was added the telephone company's overhead system. The city decided that, with the other street improvements, the wires should be placed underground to insure a more sightly business district. The layout finally approved by the city permitted overhead construction on the cross streets, running north and south, provided all circuits were removed from the main thoroughfares, running east and west. This made it possible to eliminate primary and arc circuits from the underground system. Conforming to this plan, the main overhead primary feeders were re-routed to an east and west street paralleling the business district and branch overhead primary lines were carried down the north and south streets to transformer poles which were located about 30 feet back from the intersection with the main east and west business streets. These poles were made the point of entrance for the underground secondary cables.

A thorough study was made of the load conditions and the underground system was designed to handle not only the present loads but any normal increase for a number of years to come. As it was necessary to provide both lighting and three-phase power service, a four-conductor cable was selected. This cable is paper insulated, lead sheathed, and protected by two layers of spiral steel tape and jute servings. The secondary leads of the transformers are connected to the underground cable through four-conductor pot-heads mounted on cross-arms. The cables extend down the poles to the level of the sand fill, being protected by galvanized iron conduit from the sand level to a point about ten feet above the sidewalk. From the bases of the poles the cables are buried in the sand, about one foot beneath the surface, without conduit, duct or other protection. As this sand is only a few feet above the high tide level, it is more or less damp at all times, and should serve as an excellent means of conducting the heat away from the cables. The district fed from each controller bank, which consists of two transformers connected in open delta, extends from middle of block to middle of block. The arrangement provides two cables for each district, both running from the transformers along the north and south streets to the intersection with the east and west streets, where they turn in opposite directions and extend to the middle of the block. This allows the lighting loads to be divided evenly between the two transformers. At the middle of the block the cables from each direction terminate in a connection or sectionalizing box which consists of a watertight compartment in which are two sets of four contact jaws each, to which the conductors are connected; removable blades serve to connect the two districts, which are normally left separated. The purpose of this connection box is to insure quick resumption of service in case of transformer burnout, or other failure, in either district, and to bank the transformers in multiple in the event of heavy overload on one district.

The customers' services are not connected directly to the main cables, but lateral, or branch cables, are tapped off approximately every hundred feet through splice boxes which are filled with solid compound. These branch cables run to either side of the street, where they rise to service connection boxes mounted on the fire wall. These service connection boxes are made of sheet iron, similar to a cabinet box, and each one contains a lead pot-head, in which the branch cable terminates, and a slate connection panel on which are mounted four copper current studs. The customers' services enter the top of this box through conduit and are directly connected to the current studs. This box is sealed and is not opened except for connects or disconnects. It is intended that the customers' services should extend through the fire wall at the property line nearest the service connection box, as this allows two buildings to be served without an extensive service run, but where there is more than one building to a lot it is sometimes necessary to run conduit from the service connection box along the fire wall to the building line. Just beyond the fire wall, on the property side, the service enters a fused cutout switch, mounted in an iron box, which is used as the main entrance fuse and emergency cutout in case of fire. The point of division in ownership of equipment is at the fire wall, the company owning all that portion of the service on the street side, and the customer all on the property side. The company's requirements, however, demand that all inside wiring be enclosed in conduit to the meter. As there is more or less vibration of the viaduct timbers, due to traffic, it was decided that no meters should be mounted on any of the street supporting structure.

While the system has been in operation but a short time, no important defects have developed, and there is every reason to believe that it will be a very satisfactory and economical installation, conditions of service considered.

HYDRO-ELECTRIC DEVELOPMENT IN FRANCE

Many of the available sources of hydro-electric power in France have not yet been developed—a situation which is today being met by the French government as a war measure.

Questions relating to the utilization of the power of non-navigable rivers and streams in France have been transferred for the period of the war from the Ministry of Agriculture to the Ministry of Munitions, according to the London Electrical Review. The Minister of Agriculture has stated to the French Parliament that plants rated at 400,000 horsepower have been established or are in course of construction in the Alps, the Pyrenees and central France. He also said that the generating stations were under agreement to supply for a number of years after the war a certain proportion of the energy generated at a cheap rate. Several of the plants in question were in connection with factories making explosives with a calcium carbide base. With the cessation of hostilities, it would not be difficult to convert such plants to cyanamide manufacture, which would be of great benefit to French agriculture.

CONSTITUTION AND BY-LAWS

THE SAN FRANCISCO ELECTRICAL DEVELOPMENT LEAGUE

(Much study is being given in various quarters of the West to the building up of meeting places in the larger communities where men of the electrical industry, irrespective of their affiliations with the Institute, the N. E. L. A., the Jovians, the electrical contractor associations, power company or jobbers' organization, may meet to discuss matters of common concern. Here is a proposed new constitution for the San Francisco Electrical Development League, that should prove of interest throughout the West in view of this present day need.—The Editor.)

ARTICLE I

Name

Section 1. The name of this organization shall be The San Francisco Electrical Development League.

ARTICLE II

Objects

Section 1. To encourage a more extensive use of electricity and to generally promote the welfare of the electrical industry.

(a) By urging the adoption of durable and efficient devices and apparatus and the safe and proper installation of the same.

(b) By the promotion of friendliness and good-fellowship between those engaged in the various sections of the industry.

(c) By concerted action through lectures, papers and discussions educate consumers in the application of electric current to their needs.

(d) By acting in a spirit of co-operation with similar organizations in the United States of America and in countries bordering the Pacific Ocean, to promote standardization of commerce and industrial practice in international relations.

ARTICLE III

Membership

Section 1. The membership of this organization shall not be limited in number, it being desired that it include all white male persons resident in or near the City of San Francisco, California, engaged in the electrical or allied industries.

Sec. 2. How Attained—Each application for membership must be in writing, signed by each applicant and endorsed by two members in good standing. Each application shall be filed with the Membership Committee, which shall investigate the applicant's qualifications, and if satisfactory for membership, so endorse the application and refer it to the Executive Committee. The Executive Committee shall pass upon each application separately, their action shall be secret and it shall require four affirmative votes for election to membership.

ARTICLE IV

Officers and Their Duties

Section 1. There shall be a President, First Vice-President, Second Vice-President, and Secretary-Treasurer and four elective members of an Executive Committee of eight, which shall be the governing body of the League, four of whom shall constitute a quorum.

Sec. 2. The President, First Vice-President, Second Vice-President and Secretary-Treasurer shall by virtue of their office be members of this committee, the other four being chosen by vote at the regular election.

Sec. 3. The term for which all officers shall serve shall be from the 1st of October to the 1st of March, and from the 1st of March to the 1st of October respectively, or until their successors are elected or appointed.

Sec. 4. The President shall preside at all meetings of this organization and of the Executive Committee.

Sec. 5. The First Vice-President shall preside at all meetings and perform the duties of the President in his absence.

Sec. 6. The Secretary-Treasurer shall keep minutes of all business meetings of this organization and of the Executive Committee, and perform such other duties as pertain to his office and are assigned to him by the President and Executive Committee. He shall collect all dues and have charge of all funds of this organization and shall deposit same in a bank selected by the Executive Committee. He shall not pay out money of this organization except by check bearing his signature and the counter-signature of the President or of the First Vice-President. He shall keep accurate account of all receipts and disbursements entered in books, the property of this League, which shall at all times be open to the inspection of the Executive Committee, and which shall be audited monthly by the Finance Committee. He shall in the discretion of the Executive Committee be required to furnish an adequate bond.

Sec. 7. The Executive Committee shall be subject to call at any time by the President, the Vice-Presidents, and Secretary-Treasurer. They shall pass upon applications for membership and act as the controlling and governing body of this organization. They shall direct the affairs of this League, the appropriation of its funds, and shall have the authority to cancel the membership of any member for cause deemed sufficient to them.

ARTICLE V

Meetings and Elections

Section 1. Regular meetings of this League shall be held on Wednesday of each week, except during the months of July and August (non-working months). Notice of meetings shall be sent to each member by the Secretary-Treasurer not less than twenty-four hours prior to such meetings. These meetings shall be held between the hours of twelve noon and two p. m. The second meeting of each month shall be known as the regular business meeting, and insofar as possible all business shall be transacted at that meeting.

Sec. 2. At the business meeting of the League held in the months of September and February, officers and members of the Executive Committee shall be elected by ballot. The first election under this constitution shall be in February, 1918. Prior to the meeting of the League held in the months of September and February, the President will appoint a Nominating Committee of five

members, whose duty it shall be to submit a report at the election business meetings in September and February, respectively, report to name one or more members whom they recommend be placed in nomination for each of the offices to be filled at that election.

Sec. 3. Special meetings may be called at any time by the President or three members of the Executive Committee.

ARTICLE VI.

Initiation and Dues

Section 1. The initiation fee shall be two dollars. The dues will be fifty cents per month, payable semi-annually, in advance.

Sec. 2. If the dues of any member are not paid within fifteen days from date at which they become due, he shall be notified by the Secretary, that he is in arrears, and if not paid within fifteen days from the date of such notice, he shall be liable to suspension.

ARTICLE VII

Committees

Section 1. The committees of this League shall consist of two classes, Standing and Special.

Sec. 2. Members of standing committees shall hold office during the President's period of office, or until their successors are appointed. Members of special committees shall hold office until discharged from further service by the President and Executive Committee.

Sec. 3. All committees shall be appointed by the President and the Executive Committee.

Sec. 4. The standing committees shall be as follows:

(a) Public Policy Committee, whose duties shall be to take part in any movement or legislation that has a bearing upon the electrical industry. To inspire legislation that will correct evils such as exist in the present laws affecting electric signs, inspection, fire hazards, the establishment of a fire limit, and cognate matters.

(b) Visiting and Relief Committee, whose duties shall be to visit members of this League who are ill, and to render to such every possible service. To investigate the case of any member who is otherwise distressed and upon finding him worthy to report his case to the President for such action as may be deemed wise and practicable.

(c) Reception and Attendance Committee, whose duties shall be to see that new members and visitors are introduced at our meetings and are made welcome, and also endeavor to perform a like service for those members whose acquaintance is limited. This committee shall also stimulate attendance at all meetings.

(d) Publicity Committee, whose duties shall be to see that an advance notice of all meetings is printed in the local press. To see that full reports of all meetings and all activities of this League are furnished to all local publications and to all electrical papers, together with such photographs as are obtainable. This committee shall also prepare the notices of meetings.

(e) Finance Committee, whose duties shall be to devise ways and means for raising funds sufficient to meet any deficit arising in the finances of this organization, and for raising such other funds as indicated by the Executive Committee. Once each month the Finance Committee shall audit the books of the Secretary-Treasurer, and report the results of such audit to the Executive Committee.

(f) Entertainment Committee, whose duties shall be to provide suitable speakers and other entertainment for meetings of the League in accordance with authorization given by the Executive Committee.

(g) Membership Committee, whose duties shall be to endeavor to increase the Active Membership of this League to the maximum number of desirable eligibles.

Sec. 5. The Executive Committee shall have the right to name standing committees in addition to those indicated in the preceding section.

Sec. 6. Each committee shall report through its chairman to the Executive Committee not less than once in each month, and shall be at all times under the guidance and direction of the Executive Committee.

Sec. 7.

(a) The Executive Committee shall have the right to remove any member of any committee for reasons deemed by it sufficient, and to appoint another member to fill the vacancy so created.

(b) The Executive Committee shall also select a member to fill any vacancy which may occur within it.

ARTICLE VIII

In all cases pertaining to parliamentary practice not covered in this Constitution and By-Laws, the rules contained in "Roberts' Rules of Order" shall govern this organization and its meetings.

ARTICLE IX

Amendment

Amendments to this Constitution and By-Laws may be made and new Articles added thereto only by an affirmative vote of not less than two-thirds of the members present at a regular business meeting of the League and then only provided that such amendment or addition shall have been presented in writing to a previous regular meeting of this League, and a copy of same shall have been mailed by the Secretary-Treasurer to each member of this League not less than ten days prior to the meeting at which the amendment or addition shall be passed.

TESTS OF BUILDING COLUMNS

Two fire tests of building columns are being made each week at Underwriters' Laboratories, under Associated Factory Mutual Fire Insurance Companies, the National Board of Fire Underwriters, and the Federal Bureau of Standards.

The apparatus used in the tests consists of a gas furnace capable of being controlled according to a specified standard temperature curve, reaching a maximum of 2300 degrees F. (1260 degrees C.), at the end of an eight-hour test. The load on the columns while being subjected to fire test is supplied by means of a hydraulic ram, an average load of 100,000 pounds being maintained during the test, this being calculated for the various sections according to accepted formulas for working load.

The temperature of the column furnace is measured by means of platinum and base metal thermo-couples, supported in porcelain tubes at two elevations; and that of the columns, by means of base metal thermo-couples attached to the metal of the column at four elevations and at different points in the section. The temperature indications are read with a potentiometer indicator and connections are also made to an automatic potentiometer recorder, so that graphic records can be obtained, if desired, of the indications of any set of couples.

The vertical compression and expansion of the columns, due to the load and heat, are measured over a gauge length of 37 inches in the upper half of the column by means of wires attached to the column at each end of the gauge length, the other ends being weighted and passed over an idler at a point outside of the furnace and as far from the column as room conditions will permit. The wires are protected inside and outside of the furnace by suitable insulating and protecting tubes. Readings of vertical movement are taken at intermediate points on the wires by means of microscopes mounted in micrometer slides, the true movement at the column being calculated from the distance relations of the microscopes and the fixed end of the wire, with reference to the point of attachment to the column. The lateral deflection of the column is measured by means of readings on scales placed perpendicular to and parallel with the wires.

A view of the testing furnace and accessories, with a column ready for test, is shown herewith.

The tests are continued to a breakdown of the sample, and hence no inferences as to the comparative merits of the various column designs and column coverings should be drawn from the illustrations, which show simply the effect of load and fire on a number of samples which have been subjected to test. The time required to obtain failure varies with the type of material and thickness of covering, the periods for the columns so far tested ranging from 17 minutes for the unprotected column to over eight hours for the heavier types of protection.

ELECTRIC COOKING

A recent article in the London Electrical Review gives facts and figures as to the application of electricity in large kitchens such as those of institutions. The comparison of actual costs showed that the difference in the initial cost is not so much with an installation of coal, gas, and steam, as with gas alone, but it would be impossible to use gas apparatus only on some of the installations, owing to the restricted space. The first cost is not the only cost to be considered, and should never be looked upon as the predominant factor.

When the working comparisons are considered, electricity has the advantage in almost every detail, the following being a few of the essential items which in the majority of cases, when carefully gone into, offer sufficient advantages to outweigh any difference in capital cost.

1. Cleanliness and absence of fumes.
2. Constant heating value, also the facility of reducing the heat to a definite degree, which is impossible with either coal, gas, or steam.
3. Reduced labor costs as compared with coal or steam.
4. Less floor space required, owing to the fact that electrical apparatus can be installed in almost any position, and in some cases mounted on tables or one above the other. Less floor space means less rent.
5. Economy in food, owing to less shrinkage of meat and less waste of food.
6. Saving on the renewal of kitchen utensils.



The result of fire tests of building columns

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The determination of the allowance to make for "going value" offers perhaps the greatest difficulties met with in the establishing of public utility rates. It does not seem proper to set a premium on a man's mistakes by basing it upon cost of development, nor can it be left solely to the judgment of the expert. That this intangible value should bear some fixed and arbitrary relation to a year's earnings is coming to be recognized by valuation engineers. The author is a pioneer in the field of valuation problems.—The Editor.)

GOING VALUE AS AN ELEMENT IN FIXING PUBLIC UTILITY RATES

Referring to going value as an element deserving consideration when "value" and rate-base are treated as synonymous the standing Master in Chancery, Mr. H. M. Wright, in his recent report (August, 1917) on the value of the properties of the Spring Valley Water Company*, says:

"Such additional value, if it is to be recognized here, is obviously not of a separate element in the plant, as is a conduit or a reservoir, but of the plant as a whole; an intangible value, a characteristic of the unified business structure, inhering in every part. We are here concerned, however, to estimate this value, if possible, as if it were a separate thing."

"Going value and development expense are not synonymous. One is value; the other is cost, either actual, where the form of value is actual investment in plant, or hypothetical, or reproduced, where the present valuation is by present market value, or reproduction cost."

That there is always difficulty in estimating "going value" for inclusion in the rate-base is clear from this general statement and has been universally recognized. The Master quotes Judge W. W. Morrow, who in *Bonbright vs. Geary* (D. C. Ariz. 1903) 210 Fed. 44, 54, 56, in an opinion awarding a preliminary injunction, said that a going value should be allowed but that, though often presented to him, he had never been able to determine a proper amount upon the evidence submitted. He quotes Judge W. C. Van Fleet of the District Court of Appeals, San Francisco as saying:

"All that we are agreed upon is that upon principle there should be a greater value attachable to a going concern than one which is merely in its initiative and not enjoying the benefit of patronage."

The law as interpreted by the courts requires that value be made the basis of the calculation when the sufficiency of the charges for service or for the output of a public utility is in question, and it is for this reason that the embarrassment plainly evidenced by these quotations has resulted.

In the Spring Valley rate case already referred to the Master refers to the difficulty of determining going value when he says:

"It is the intangible nature of the going value which makes it difficult to prove. * * * A large part of the aggregate wealth of the world is intangible, without separate market value or ascertainable reproduction cost. In *Adams Express Company vs. Ohio*, 166 U. S. 185, the Supreme Court sustained the taxation of an express company upon an assessment of property largely in excess of the value of tangible property. The intangible property is at one place ascribed to franchises, and in another to good will; the name is not important."

Justice Brewer, in delivering the opinion of the Supreme Court in this case, uses the following language in discussing intangible property:

"To say that there can be no such intangible property, that it is something of no value, is to insult the common intelligence of every man. * * This is eminently a practical age; courts must recognize things as they are and as possessing a value which is accorded to them in the market of the world."

In the light of such opinions by our highest tribunals, universal recognition of the fact that a business may have going value is to be expected. Whether or not it is logical or wise to include such value in the rate-base of a public utility is another question elsewhere considered.

How can this value be measured? This is the problem for immediate consideration and it may as well be stated at the outset that no acceptable solution thereof has yet been offered.

In comparing two business enterprises alike in all respects except that the one already enjoys a fully developed business while the other has just emerged from the construction stage and is about to begin operation, a difference in value is readily recognized, and the appraiser of the first, which is already a going concern, would naturally be inclined to take the view that the advantage which it has over the second can be measured by the cost of developing the business and that this cost in the absence of other satisfactory standards may be accepted as an index of the "going value."

This appears so plausible that many economists and engineers have adopted a procedure based on this reasoning for estimating going value. They have recognized, however, that while cost of developing business can be treated as an investment of capital, that it would not always be fair to accept the actual cost in each individual case as representing a proper allowance in the rate-base for cost of development. If this were done it would be equivalent to placing a premium upon inefficiency because the actual cost of development would naturally be greatest in the case of the property which has been least efficiently managed. To obviate this difficulty recourse has been had to the reproduction method with an attempt to visualize and estimate the cost of development which would be incurred if under present day conditions a plant had to be reproduced. In the application of this method of determining the advantage expressed in terms of money which the going concern has over another exactly the same, and in the same market, but with business not yet established, it is necessary to assume that some definite time will elapse between the completion of the system and the full development of the business as commanded by the concern whose "going value" is

*Spring Valley Water Co. vs. City and County of San Francisco (rate case).

to be appraised. It does not seem to the writer any simpler or more satisfactory to thus, on the judgment of the expert, make an assumption of the time that would be required to establish a business than it would be on the basis of actual experience in the same line of business, in the locality involved and elsewhere, to form an opinion as to what would be a proper allowance for the cost of development.

In any business which is already established, an analysis may be desirable of the various elements that make up the intangible values of the property. In such cases some such procedure as that of estimating the cost of re-establishing the business under present day conditions may be of service in segregating "going value." But when earnings are to result from rates yet to be fixed the case is somewhat different, and the question will arise whether the relation between cost of development actual or hypothetical, however ascertained, is a safe guide to the going value which should be created by the profits of the business in excess of interest on the invested capital.

Intangible values of whatsoever nature result from high earnings. They include not only "going value," but also in some cases water-right values and whatever may be included in such terms as "franchise value," "good will," and the like. Such values do not exist unless the rates are higher, as the writer has elsewhere pointed out they should be, than would produce net earnings equaling the return ordinarily expected from money loaned for use in similar enterprises.

The difficulty of using a hypothetical reproduction of an existing utility property, as a means of estimating the cost of developing the business, is apparent from the following consideration. The comparative plant is assumed to be exact reproduction of the existing plant. There is no competition between the two plants. It might be assumed that the moment that the comparative plant is completed, it will be in full service at the same earning power as the established plant. There would then be no appreciable development period. If such a period is admitted it implies a lack of completion of the comparative plant or the development period should be measured only by the time that it would take the consumer to put himself in position to avail himself of the service. The market in such a comparison is assumed to be at hand. The expert who resorts to this method of estimating going value will give his judgment wide latitude, as his conclusions are not apt to be convincing.

It is well to bear in mind, however, that if a community which is served by a public utility had undertaken the establishment of this utility as a public enterprise it would have been subject to the same and perhaps greater costs in developing the local business than the costs which were incurred by the owner of the property. The losses in the early years, on the same chances that there would be loss, would have confronted the public as it confronted the private enterprise. The cost of establishing business is, therefore, an element apart and while perhaps in some measure and under a multiplication of facts relating to many enterprises, the cost of establishing may be some guide to what the normal going value should be, it will be more logical to treat this cost either as a part of the capital legitimately in the enterprise, or taking

the other extreme, as a business loss to be amortized out of earnings within a reasonable time.

While the cost of establishing the business, including early losses and expenditures for unsuccessful work are not a direct measure of going value, they are, nevertheless, in so far as they were legitimate, of that class of expenditures which should, as already stated, come back to the owner of the property sooner or later. The mere knowledge that this is the case, or the probability that the owner will some time recover them, adds value to the property. To add them in the exact amount shown by the cost records in any particular case would not, invariably, be a fair procedure. The owner who builds with care and under the best expert advice, and who pushes his work forward as rapidly as the market to be served will justify, and who enters immediately upon a profitable business without any lean years, is entitled to a reward for his able management and the success of his enterprise. The "going concern value" of a plant constructed under such favorable circumstances is as great as the "going concern value" of other plants of a similar character but burdened perhaps with large expenditures for unsuccessful work and for the development of business.

The combined experience of all utilities of similar character should in the long run establish the addition which should be made to the earnings, either to amortize a fair allowance for this class of expenditures in a reasonable time or to provide an adequate return thereon if treated as investment or as an increment of the value of the going concern. In the light of this conclusion it would not be fair in the individual case to treat all losses during lean years and all unproductive expenditures during the constructive period, such as water tunnels or wells that produce no water, structures that fail during erection, damage by fire and flood, earthquake or war, as additions to value or as additions to a rate-base. These are losses and if occurring after operation has commenced are naturally treated as the reverse of earnings. They cannot with propriety be added to the valuation of the physical properties, though it may be eminently proper on account thereof to estimate the cost of reproduction liberally. In some form they should be taken into account in fixing rates. It is rarely practicable to determine such losses and unproductive expenditures with accuracy. These expenditures and losses may be large and yet they should ordinarily be assumed to have been incurred under competent advice. It should generally be assumed, in other words, that it could not be foreseen that what turned out to be unproductive work would have no value. The easy way to deal with such expenditures is to add them to the rate-base valuation, giving them a name and treating them as a measure, in part at least, of intangible values. While this may appear reasonable when the amount involved is small, or not beyond what the sum of human experience would seem to indicate as fair, the other case can readily be foreseen, as already explained, in which this would not be so. To lay down a rule that actual losses whether during construction or in the early years of operation, are to be treated as elements of value is never logical.

It should be noted, too, that there is a clear distinction to be made between the expenses ordinarily

classed as "overhead" and "development cost." The overhead expense is an expense incurred during construction and is naturally and logically made a part of the cost of construction. The development cost is an additional outlay during operation, which is necessary to maintain and operate the property during the time when the receipts for commodity furnished or for service rendered are insufficient to meet operating expenses and a fair interest return on the invested capital.

It is apparent from what has above been stated that "going value" and the value of physical elements are elements apart; between which, in other words, there is no definite relation. "Going value" then is not dependent upon the capital which is invested in any property. And yet "going value" grows with the business enterprise. It is subject to appreciation. This suggests that when once the going value is determined which efficiently managed enterprises of various kinds should ordinarily have, this value can be brought into some relation to the volume of business. This thought has heretofore been advanced by the writer and by others who are contending that it would be fair to allow a going value about equal to one year's income to be created by adequate earnings. On this point Mr. Leonard Metcalf, a consulting engineer of large experience in valuation matters, in the recent Spring Valley Water Company rate case, said:

"In terms of gross annual revenue, development expense is found to be approximately equal to one year's gross revenue as of the date of valuation, in the case of ordinary water-works properties of medium and small size, and between one and one and one-quarter times the gross annual revenue in the case of the larger properties—the cumulative interest during construction charges incident to the long period of construction involved in the building of the larger works being accountable for the difference."

Bearing on this same subject the writer in a paper read in 1912 before the American Society of Civil Engineers, said:

"The most logical course to be pursued, and the one which is always open to the appraiser" (rate-fixing authority) "is to use the best available means for determining the amount of capital which is properly invested, then to determine what the earnings should be to yield an ordinary return on the investment thus ascertained, and then to increase these earnings by an arbitrary" (reasonable) "amount, which may vary within wide limits, not only to compensate for past losses and for the hazard during construction and operation, but also as a compensation for management." And again: "Any addition to the rate of return * * * * if there is certainty that it will be earned, is the real basis for the intangible values as they would be taken into consideration by a purchaser."

Along the same line of reasoning Mr. Allen Hazen, also of the highest standing among consulting engineers who have devoted attention to valuation matters, in the rate case already referred to, says:

"When a business is established and going and earning a certain revenue, it is, normally worth to the investor what that income amounts to, capitalized on a rate of return on other investments of equal security, and that the rate of return is normally less than the amount which a company has to have the chance of earning, if it can, in order to induce capital to go into an enterprise of that kind; in other words, if you want to build the Calaveras works, and you want people to put their money into the enterprise on a chance of earning some rate of return without any guarantee that they will earn it—simply on a chance—we have to make that chance

7 per cent, we will say. Now, when the Calaveras works are built, and if the enterprise is successful and it earns that 7 per cent on what it has cost, and is established, then the man on the street will capitalize that income at 6 per cent and the plant is worth one-sixth more than it cost."

The Master in Chancery in this case upon reviewing the testimony of Mr. Hazen, of which the above is but a brief extract, then goes on to show what going value would be created if various rates of return appropriate for a going plant and a like plant ready to begin business were assumed. It is with some satisfaction that the writer makes note of these facts and of the endeavors by others to lay a basis in the earnings for "going value," because they confirm his conclusions that this basis lies there and that the result of the capitalization of the earnings should not make its appearance in the rate-base. (See preceding articles.)

May we not conclude then, that in the case of the public utility which is subject to regulation, its intangible values arise from some allowance in the earnings, in excess by some predetermined amount of the earnings, which would just yield a proper rate of interest on the actual capital reasonably and properly invested. When the sum of all intangible values is thus determined (by capitalization of a part of the earnings) it will matter little what name is used to designate them. But the increment of earnings in excess of the ordinary interest rate on investments, in safe going concerns, should be so fixed to cover also any amortization made necessary by obsolescence, or loss by fortuitous events, and to cover whatever allowance is to be made as compensation for management and as a share in general prosperity, possibly in lieu of appreciation. When the limitation of this excess by rate fixing authorities is under consideration, it can probably be more nearly standardized by bringing it into some definite relation to volume of business, than in any other way.*

*See "Public Utility Rates and the Volume of Business," *Journal of Electricity*, Vol. XXXIX, No. 10, page 450.

POWER PLANT FARTHEST NORTH

A 45-kilowatt hydro-electric plant for light and power in the town of Chitina, Alaska, has just been put in operation. It was built by the owners, O. W. and M. S. Nelson, has been under construction for two years and represents an outlay of \$22,000, making it probably the highest price per kilowatt plant in the world. One of its distinctive features is that it is the farthest north of any year-round hydro-electric plant on the continent. Adjacent to the town of Chitina is a three-acre lake which is fed by a number of springs of such mildness that the lake does not freeze to any considerable depth even in the coldest weather. This lake is 100 feet above the Copper river and separated from it by a ridge. By driving a 1400-foot tunnel through this ridge the water from the lake is carried over to the Copper river side, where it is dropped down a hundred feet through 270 feet of 16-inch steel pipe. The tunnel was driven through 900 feet of frozen earth and loose rock and through 500 feet of extremely hard solid rock. The earth and rock were thawed with steam points.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

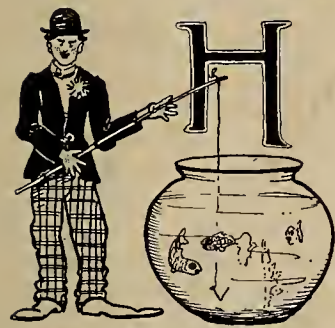
CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

NOVEL ELECTRIC WINDOW MOVIE DISPLAYS

BY ERNEST A. DENCH

(Suppose it were some other man's window advertising say, tea-kettles—would you stop and look at it? Probably you would if it were one of the window displays suggested here. What is more, you would remember where you saw it, and would be more than likely to go in and ask about it. The idea is not an expensive one, but utilizes the appeal of the movie to the moving-picture fan. The author is a well-known writer on moving-picture subjects.—The Editor.)

Photoplay Scenes in Your Window



CHARLIE ISN'T FOOLING—
this time — He is fishing for everything in
ELECTRICAL EQUIPMENT
which he knows can be found here —

A WINDOW DISPLAY

If you wonder what this has to do with an electric shop, so will the customer, and he will remember the display.

AVE you noticed how effectively the enterprising photo-play exhibitor uses photographs, or stills, as they are called in the studio, of scenes from forthcoming attractions for lobby display purposes? How about adapting the idea to a window display of your own? These photographs attract a good deal of attention and serve as an appetizer for the production in question. But you will be cheating yourself if you permit the exhibitor to attract all the public-

licity, relying upon people stopping to look in your windows as sufficient recompense. It is, therefore, up to you to run only pictures relating in some way to the electric industry. Suppose one of the scenes shows an electric company's showrooms with the hero in charge. The star's press agent may have circulated a story to the effect that the player spent several days in an electric company's showrooms, learning the business.

"Making the Movies" (Macmillan) is a book full of anecdotes concerning the players and the making of photoplays which can be done over to fit in with the pictures you obtain from the local exhibitor.

Stage Settings in Your Window

The flat white screen is fast disappearing from the motion-picture theatre. The modern exhibitor prefers to enclose it in an artistic stage setting of a permanent character, with special lighting and color effects.

This suggests possibilities, one of which has already been capitalized by an exhibitor in co-operation with an electric company. The exhibitor supplied the florist with a miniature model of his stage setting for window display purposes. In the setting were costumed dolls to represent the principal actors appearing

in photoplays at the theatre in question. The dolls are changed with every new program and passers-by stop to admire the clever miniature models of the stars.

If you desire to carry out this stunt, why not inaugurate a contest for the best dressed-up doll of Mary Pickford, or any other favorite they may care to choose.

Another plan involving less trouble and expense is to purchase a Charlie Chaplin statue for about 50 cents. Place it in the window, attach a tiny fishing rod to his arm and place the rod in a goldfish bowl. Below the whole, display a card, worded somewhat as follows:



MARY PICKFORD
The picture carries an electrical advertisement

"Charlie is not fooling this time. He is fishing for everything in electrical equipment, which he knows he can obtain here."

The "Props" Window
"Props" in motion-pictures are not always what they seem. Fix up a display with the following description:

"When the movie villain brings down an electric lamp on the hero's head, he is not hurt, as he pretends to be. The lamp is only papier-mache. This may be all right for 'reel' purposes, but for real use you want

lamps that will give good service. We sell such kind."

Co-operative Lobby Displays

The motion-picture theatre's window is the lobby display. Many exhibitors deem a few photographs sufficient; others differ. The enterprising manager devises all kinds of stunts for a feature production, from dressing up wax models to represent certain characters, to making the entrance look like the approach to Hades. What kind of exhibitors do you have in your town? Are they partial to out-of-the-ordinary displays? If so, they are your friends, for they will need your co-operation every now and then.

An exhibitor of my acquaintance wished to have a model kitchen installed in his lobby. He asked the local electric company for the loan of an electric stove. The electric company agreed, on the understanding that a card be displayed, as follows:

"Stove loaned by the Blank Electric Company."

And it is worth while recording that the electric company did more business while the lobby display was on exhibition.

Capitalizing the Thirst for Movie Information

The popularity of the motion picture is not a fad—it is as deeply rooted as a sturdy tree, and, like one, will continue to gain in strength from year to year. The collecting of photographs by the fans is only equaled by their thirst for information on movie subjects. It pays to appease it, however insignificant your efforts may appear alongside those of the producers, exhibitors and publishers.

Why not incorporate some photoplay material in your newspaper announcements? What about your showrooms window? That is a dandy place for announcements, while you can place a bulletin board outside your showrooms. When putting over a house-to-house circularizing or mailing stunt, why not head the sheet as though it were a motion-picture publication? It will at least ensure same being read. Think, too, what valuable ammunition it would prove if distributed to movie theatre patrons.

Ten or fifteen cents occasionally invested in a copy of a motion-picture trade journal will yield more than sufficient material for your purpose. As it is news, there is no copyright.

Playing Up Your Service

Your employees may be as perfect as they can possibly be, yet some unreasonable client is apt to complain with absolutely no reasons for so doing. Here is an extract from an interview I recently had with Lillian Walker, the screen favorite:

"In acting business roles, what has impressed me most is the scant consideration some customers show to those who strive their best to please them. So,

whenever I enter a store, I endeavor to get the clerk's viewpoint, for if I give him a chance, he will surely please me."

Have a sign painter execute a sign for your window display. Leave space in the middle for Miss Walker's photograph. Head the card: "LILLIAN WALKER SAYS——." Follow on with her remarks, and then, in large, bold letters, conclude like this:

"Have you ever tried acting upon Lillian Walker's advice?"

The Movie Star Photo Ad.

Patrons of a down-town photoplay theatre pausing to look in the window of the local electric company's showrooms, were greeted with the following announcement:

"Free! Come in and get your favorite movie star's picture. You can collect hundreds of different ones."

Surrounded by the card were small pictures (about a third the size of a postal card) of the various screen idols. Those who went in for a picture without making a purchase carried a permanent advertisement of the electric company, for the blank space on the back was utilized to this good purpose.

The electric company, of course, had an added advantage in that their stunt appealed to photoplay fans at the right moment, but it need prove no deterrent in your case should the nearest movie show be located many blocks away. The dyed-in-the-wool fan (and their number is legion) even carries the fever to bed with him.

Another electric company divides the cost of these photographs with the leading down-town photoplay exhibitor. They announce in their window:

"You can see these stars in photoplays at the Ideal Theatre. But your favorite's picture may be had for the asking."



Night illumination in Utah is not prohibited by the Fuel Administration, for electricity is hydro-electrically generated. The effective flood lighting of the new Latter Day Saints church offices is one of the features of the city. Eighteen G. E. type "L 1" flood lighting projectors are mounted across the street, some two hundred feet distant. The installation was made by Eardley Brothers of Salt Lake City.

Western Ideas

AN ATTRACTIVE INVITATION card is half the secret of a successful meeting. This interesting meeting notice was gotten out by the Pacific Service Employees' Association, an organization composed of members of the Pacific Gas & Electric Company, but it provides interesting reading for anyone interested in getting up similar meetings or special gatherings.

Imagine yourself invited to your contractor-dealer's meeting in similar style. The "star" attractions for this astronomical gathering would at least catch your eye, particularly that subject which has "eclipsed" all others, and which threatens to land a "meteoric" punch on the Kaiser's "solar" plexus.

Even the most serious evening isn't hurt by a little fun, and occasionally a gathering in lighter mood, with opportunity for socially getting acquainted, provides the basis for better feeling in the regular business of an association. If you haven't had a meeting which promises to be at least as entertaining, "planet" now.

HINTS FOR FAIR EXHIBITORS have been gotten out by one of the large jobbing and manufacturing concerns which should prove of value to the contractor-dealer who is planning to exhibit at the state or local fair:

1. Select your space in pathway of standard attractions, such as a band, university display, etc.
2. It is advisable to exhibit, wherever possible, in an enclosed building to protect apparatus from tampering and bad weather.
3. If Fair officials permit, operation of gas engine pipe exhaust should be put through floor into a post hole at least four feet deep.
4. Where the use of gas engine is not permitted an electric motor of ample capacity should be used and concealed. The engine may be installed over this place to preserve the illusion that the engine is operating the dynamo. Explain "why" to interested visitors.
5. If engine is used and a large number of electrical devices are constantly operated, do not keep engine running continuously. It is better to charge batteries several hours daily. An overheated engine makes a bad impression.
6. Use cards to record names of those who evidence an interest. Such names are a valuable asset.
7. Some railroads permit exhibit material to be shipped free of charge back to original shipping point. Get a certificate from secretary of Fair and present it

with bill of lading to traffic man who will make adjustment.

8. AND ADVERTISE, ADVERTISE.

A CROWD GATHERS every half hour to watch the demonstration of Hoover vacuum cleaners which is going on inside this window. The store, which is that of the Waterhouse Company on lower Market street, San Francisco, is well located, with foot passengers continually passing. That is, they continue passing—until they are arrested by the sound of a voice which seems to come mysteriously from above their heads, and the sight of a vacuum cleaner being demonstrated. The demonstrator not only carries out the

**Pacific Service
Employees Association**

**Point Your Telescope This Way and
Observe the Star Attractions for Our
Oakland Meeting, Tuesday, Jan. 22nd**

At EBELL HALL
1640 Market Street, Oakland, 8:00 P. M.

The meeting will be under the auspices of
MR. FRANK A. LEACH, Jr.
Manager of the Alameda County District, who will talk on the subject which
now threatens to eclipse all others.


THRIFT
at THRIFT THE BOYS "OVER THERE"
Until they land a meteoric punch on the Kaiser's solar plexus.

DR. THOMAS A. ADDISON
Prestige Great Manager of the General Electric Co., will speak on the subject
"AMATEUR WORK IN ASTRONOMY"
If you have nebulous ideas about the Milky Way, come and have the facts
revealed—Come anyway—Please! Please!

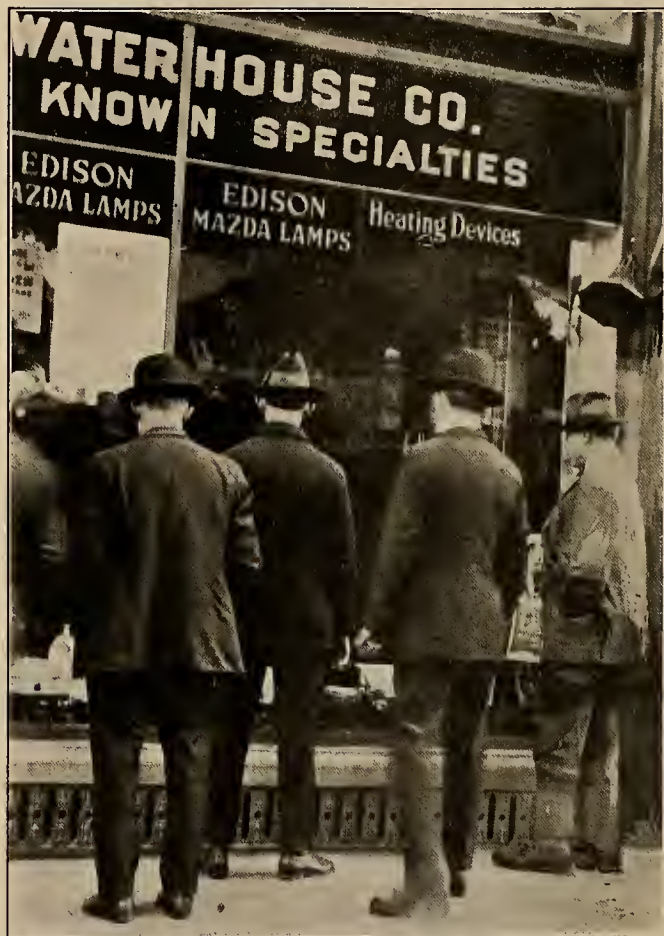
DANCING AND CARD PLAYING
A Valuable Prize Will Be Given to the Winner on Cards

MEN MEMBERS: Bring the ladies, that's how you can shine

LADY MEMBERS: Bring your friends and relatives in the spirit



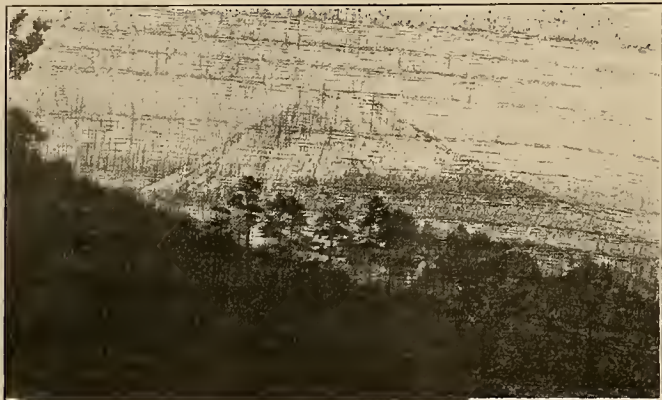
It is not necessary always to be formal in your invitations



There is a demonstration going on inside

various operations involved, but at the same time explains to the gathered onlookers the superiorities of the Hoover sweeper. Her voice is transmitted to them through a speaking tube, emerging at the phonograph horn which is here to be seen at the right of the picture. To complete the display, a small transparency toward the front of the window advertises the cleaner, the light which illuminates it flashing off and on periodically. The demonstration has attracted considerable attention, and some of the spectators are likely to be in the position of the Denver woman in the recent campaign for the signing of Food Pledges, who was found to have confused the name of the national food administrator, Herbert C. Hoover, with that of the much advertised electric sweeper.

A **WOODEN CARD** is the medium upon which this very simple and artistic Japanese landscape has been printed. The use of the thinly shaved wood is most striking and the novelty of the conception lends itself to many further applications. It would be particularly effective in the construction of such advertising matter as calendars, or cards used for distribution purposes. With a pretty picture of slightly dif-



A Japanese idea which combines novelty with beauty

ferent shape printed at the top, a book-mark, bearing the firm name, would be a durable and acceptable reminder.

The card as it stands, perhaps, offers no definite application to the contractor-dealer's business, but it is evidence of the fact that attractiveness in detail pays. The Japanese have carried this into every form of business. If a placard must be placed in the window, it is not a hastily drawn bit of butcher paper, but a thing of beauty in itself, however simple; something which adds rather than detracts from the display grouping.

WANTED — A TRADE MARK for the California Association of Electrical Contractors and Dealers. A prize of \$100 has been offered for a suitable design. The advisory committee handling the California Electrical Co-operative Campaign is desirous of assisting the California Association of Electrical Contractors and Dealers in finding and selecting a suitable trade mark for their organization, and to this end have appropriated \$100 to be given as a prize for the most acceptable design submitted to it not later than February 25th. The design must be original, so that it may be copyrighted, and must be acceptable to the executive committee of the California Association of Electrical Contractors and Dealers. It is preferable, but not strictly necessary, that the design should also be suitable for electrical contractors and dealers' associations in other states. It is desired that the trade mark design be such that it might be used on the dealers' stationery, in their newspaper periodical advertising, and also used as signs for window decalcomanias, and for outdoor two-sided metal signs. The committee reserves the right to reject all designs submitted if none prove acceptable, and also to divide the prize money between not more than three, if a combination of features from two or three designs submitted will give the committee a satisfactory trade mark. Designs received showing postmarks later than February 25th will not be considered. Mail your sketches to the "Trade Mark Committee," California Co-operative Campaign, 505 Rialto Building, San Francisco.

A GOOD WINDOW DISPLAY is the special feature of most contractor-dealers' Christmas campaigns, but this pleasing window, which was a feature of the Utah Power & Light Company's Electric Shop this last Christmas, is only one of a series of attractive

displays carried throughout the year. In the words of the superintendent, Philip Conley:

"Most merchants think too little of the value of their show windows. Good attractive window trims, always up to date, lend prestige and profit to the store they sell for, and people get the habit of stopping to see what is new, if the windowman makes the most of his job. Mechanical motion and lighting effect, which may be worked into most any electrical goods display add attention compelling power that stops the prospect. The man in charge of this work should be allowed to use his own judgment with regard to expense. When he is instructed to go easy on the display budget, he can always come back with an excuse; but permitted to go 'on his own hook,' he cannot come back, and generally will get better results."



Inexpensive but effective

LLOYD'S REGISTER OF SHIPPING—USE OF
CABLES IN ELECTRIC LIGHTING
ON BOARD VESSELS

(In the present times of active ship building, every contractor should have a full set of wiring rules in his note book. Various rulings used with ships destined for different purposes have been given from time to time in these pages. Almost all vessels built for the Allies except French boats, use "Lloyd's Register of Shipping" Wiring Rules, as well as many vessels built for the United States. The following rules governing the use of wire, wire cables and the practice in making joints, form part of this code.—The Editor.)

Leads or Circuits

1. The copper used in all wires or cables should have a conductivity of not less than that of the Engineering Standards Committee's standard, and the wires must be protected by tinning from the sulphur compounds present in the insulating material.
2. The sectional area of the copper wires in the cables should be in proportion to the current carried, and should not be less than as given in Table 1, which is in accordance with the rules of the Institution of Electrical Engineers as revised in April, 1911.

Wire Gauge—Table No. 1

No. of Wires and Gauge in S. W. G. or in inches.	Nominal Sectional Area of Conductors, sq. inches.	Maximum Current Permissible. Amperes.
3—25	.0009	3.7
3—24	.0011	4.5
3—23	.0013	5.3
1—18	.0018	7.2
3—22	.0018	7.2
7—25	.0022	8.6
3—21	.0024	9.5
1—17	.0025	9.8
7—24	.0026	10.4
3—20	.0030	12.0
7—23	.0031	12.4
1—16	.0032	12.9
3—19	.0037	14.8
1—15	.0041	16.3
7—22	.0042	17.0
1—14	.0050	19
3—18	.0053	20
7—21	.0055	21
7—20	.0070	24
7—19	.0086	28
7—18	.0125	34
7—17	.017	40
19—20	.019	43
7—16	.022	46
19—19	.023	47
7—.068 in.	.025	50
7—15	.028	53
19—18	.034	59
7—14	.035	60
19—17	.046	70
7—.097 in.	.050	74
19—.058 in.	.050	74
19—16	.060	83
19—15	.075	97
19—14	.094	113
19—.083 in.	.100	118
37—16	.117	130
19—13	.125	134
37—15	.150	152
19—.101 in.	.150	152
37—14	.182	172
37—.083 in.	.200	184
37—13	.250	214
37—12	.300	240
37—.112 in.	.350	264
61—13	.400	288
61—.097 in.	.450	310
61—12	.500	332
61—.108 in.	.550	357
61—.112 in.	.600	384
61—.118 in.	.650	410
91—.098 in.	.700	434
91—.101 in.	.750	461
91—.108 in.	.800	488
91—.112 in.	.900	540
91—.118 in.	1.000	595
127—.101 in.	1.000	595

The above sizes provide security against undesirable rise in temperature. For long leads larger wires will be required to prevent undue drop of voltage.

3. Except for wiring fittings the sectional area of any copper conductor must not be less than that of

No. 18 S. W. G. All copper conductors having a greater sectional area than No. 14 S. W. G. must be stranded.

4. The insulating material must be either vulcanized rubber of the best quality or it must be equally durable.
5. The insulation must be such that when the cables have been immersed in water for 24 hours it will, while still immersed, withstand 1000 volts for half an hour between the conductors and the water.
6. The insulation resistance should not be less than 600 megohms per statute mile at 60 F. after the cables have been immersed in water for 24 hours, the test being made after one minute's electrification at not less than 500 volts and while the cable is still immersed.

Joints

1. Joints in branches, or of branches with leads of small circuits, must be made in properly constructed water-tight junction boxes, or should have the copper wires thoroughly soldered and the insulation carefully carried out, all the joints being made water-tight. Conductors of larger sectional area than 7/18 S. W. G. must be soldered to proper lugs for connection. Joints in flow and return wires should not be made opposite one another. All joints should be in accessible positions, none being made in bunkers, cargo spaces, or spaces which may at any time be used for carrying cargo, stores or baggage.
2. For soldering wires, the fluxes used must not contain acid or other corrosive substances.
3. Where practicable, the leads should be placed where they can always be accessible; if they are laid in wood battens the covers should be screwed on, not nailed, and care should be taken that the casings are so arranged that water will not lodge in them. Cables which are properly covered with protective metal sheathing, or which are protected by galvanized wire armouring, may be unencased. They should, however, be secured by screw clips, not by staples. All sharp bends in cables should be avoided.

4. All cables which are liable to be exposed to the weather or moisture should be lead covered, or be otherwise specially protected. Where great heat is experienced, no wood casing should be used, but the cables should be protected by iron casings, or if they are not exposed to mechanical injury, they may be armoured with galvanized wire and fastened to decks or bulkheads with screwed clips spaced not more than 12 inches apart.

5. If cables are led through cargo spaces, coal bunkers, or spaces which may at any time be used for carrying cargo, stores or baggage, or which are not at all times accessible, they should be strongly protected against damage, preferably by iron casings. If they are led through metal tubes, these must be strongly secured, and should be fitted so that water cannot lodge in them.

Armoured cables may be used without casings or tubes provided they are strongly secured to the under side of decks or to bulkheads by screw clips and provided they are armoured in conformity with the standard of the Engineering Standards Committee, as shown in Table 2.

Armoured Cables—Table No. 2

Diameter of Cable to be armoured measured over lead covering.		Single Wire Armouring.	Double Wire Armouring.	Metal Tape Armouring.
Above, up to and including.		Size of Galvanized Wire.	Size of Galvanized Wire in each layer.	Thickness of Metal Tape, two layers to be used.
Inch	Inch	Inch. S. W. G.	Inch. S. W. G.	Inch.
.50	.50	.072 No. 15	.056 No. 17	.03
.50	.75	.092 No. 13	.072 No. 15	.03
.75	1.00	.104 No. 12	.080 No. 14	.04
1.00	1.25	.116 No. 11	.092 No. 13	.04
1.25	1.50	.128 No. 10	.104 No. 12	.04
1.50	1.75	.144 No. 9	.116 No. 11	.04
1.75	2.00	.160 No. 8	.128 No. 10	.04
2.00	...	.....	.....	.06

6. Where cables pass through beams, bulkheads, or other ironwork, they should be led through special fittings of sheet lead, hard wood, or vulcanized fibre to prevent their being chafed, and where they pass through decks they should be led through metal tubes lined with wood or vulcanized fibre, and securely fastened to the decks, standing at such a height above the deck level that water cannot stand above them. Where cables pass through water-tight bulkheads the fittings must be made efficiently water-tight.

Where cables pass through insulation they should be of the highest quality, and should preferably be armoured. They should be strongly protected against chafing or other mechanical injury. They should be of at least the sectional area given in Table 1 for cables carrying twice the amperes which they will have to carry. The insulating material in their vicinity should be silicate cotton, not charcoal or cork, and where the cables pass through the wood linings of the insulation, the wood should be covered with sheet lead.

7. In vessels having spaces allotted alternately for passengers and cargo, the lamp fittings in these spaces should be removable, and the terminals so arranged that they can be properly covered up with strong metal covers, or the whole of the fittings should be similarly provided with strong iron boxes provided with iron covers, or otherwise securely arranged to prevent the fittings being tampered with.

THE CONTRACTOR-DEALER IN THE BANKING BUSINESS

BY ALBERT H. ELLIOT

(If you judge the success of your business by the turnover of your capital invested, you have got to keep that capital moving. The practice of credits and cash discounts all down the line, virtually makes each man the banker of the man below him—and leads to half the complications which beset the electrical industry. The author is secretary of the Electrical Credit Association of the Pacific Coast, and secretary and attorney for the Pacific Coast Electrical Supply Jobbers.—The Editor.)

Co-operation means "working with one another, but a great many contractors believe that the word "co-operate" means working on one another, and they proceed to put their definition of co-operation into practical effect at every opportunity. It pays to co-operate—it pays every man in the game, if we can tie all the interests in the electrical business together. It even pays the consumer.

One of the points at which co-operation is most needed is that of fixing the practice in granting credit to customers and in trade acceptances. I should say that the great trouble of the electrical business, looking at it from the viewpoint of trade acceptances, is

that while our people are fairly good merchants from the standpoint of electrical appliances, and are fairly good masters of electrical power, yet I have never yet seen an electrical man in my life that did not want to be a banker. That is the queerest thing about the electrical business. Now, we are going to put the electrical man out of the banking business.

All that is needed is a little practical exemplification of co-operation. A contractor goes out and takes a contract for an installation job from the owner. The trouble usually begins with the owner. The contractor finishes his work, installs his electrical apparatus, has his inspection and his certificate of inspection—and goes to the owner and says: "My job is up; I want my money." The owner says: "I am very sorry, but I haven't the money right now—but I will pay you in thirty days." And when he gets around to pay it, it is ninety days. Now, during that time, the contractor has his capital involved in the cost of the material and the cost of the labor he has put into this tied-up job, and the contractor becomes, from the moment that he finishes his work, the banker of that owner. The owner is borrowing his money and most of the time isn't paying any interest.

Now, we want the contractor at that point to say: "I am in the electrical business and I am not a banker. You own this property where I did the work. Now, you go to your banker and borrow the money at the current rate of interest. I cannot afford to keep my capital tied up, when I can turn it three or four times. I have to earn an average of 16 per cent or I cannot keep in business. You go to the bank and let him give you the money and he will charge you 6 per cent, and you pay me my money and I will put it into another job."

Then the electrical contractor goes to the jobber and says: "I want to buy goods from you." The cash discount is an evil of the business. Why should the jobber reward you for paying your bills, paying what you owe when you owe it? The contractor and dealer owes the jobber the money and he ought to pay it. If the contractor and dealer is kicked out of the banking business and is getting his money promptly when the work is installed, he will turn around to the jobber and pay him. We say to the jobber: "You have got to get out of the banking business. No more banking business for contractors and dealers." When the jobbers' goods are sold, they are going to collect in cash from the contractor and dealer because the contractor and dealer collects cash from the owner, and he is getting his cash from the bank. The bank will get all the business and a good deal of it will be in the form of trade acceptances. No reason has ever been shown me why a manufacturer should reward a jobber for promptly paying his bills. There is no reason to sustain a 2 per cent cash discount. Outside of the banking business, a man who has capital tied up in a business ought not to be compelled to tie up an immense additional amount of money in the business in order to carry current orders, when we have the banks to do that and that is their business. You have got to keep your capital flowing and liquid. No branch of the electrical industry can afford to do a banking business.

CONSERVING LABOR IN A JOBBING BUSINESS

BY E. J. WALLIS

(There are three shortages of importance in the United States today—fuel, transportation and labor—and of these three, labor is the only one which presents permanent difficulty. This inspiring article, which offers concrete suggestions as to how the electrical jobber can meet the labor situation, was read at the January Pacific Coast Supply Jobbers' convention at Del Monte. The author is Pacific Coast manager of the Western Electric Company.—The Editor.)

If we were not so intensely concerned with a very definite personal duty and responsibility, it would be almost presumptuous, as it is certainly difficult, to attempt to emphasize the demand for a conservation of labor. Every agency preaches it and the word conservation is on our lips constantly.

We often experience some hesitancy in speaking the word because we have the feeling at times that we are not doing all we can in response to its demand, and at such times we probably are not. We are mindful also that there is a certain menace to which the word itself is subjected and its devitalization is possible, as has been the case to some extent with the word co-operation, which is preserved in its strength only when the element of sacrifice that is involved in what it should express is appreciated. Conservation will have a vital strength only if that same element of its character is recognized.

While it is difficult to put any new appeal into the demand for conservation, we can consider its application to our own circumstances and conditions and perhaps discover ways and means by which our business can be made to respond.

As a part of his daily tasks, the executive staff of a jobbing business has had the ever-present responsibility of conserving profits by careful economies and in times of reduced business, retrenchment has presented itself as a necessity, but retrenchment always has been garbed in mourning black. The old familiar demand is now resplendent in brilliant raiment of patriotism and tells us "If the Allies face a crisis today, it is a moral and political one, not a military crisis."

We are also told that we must equip ourselves as if the war were going to last ten years, but speed ourselves as if it were going to end in six months. Our enemy has very largely made the style of this war, at least so far. We have altered the style some to suit our taste and we will make further alterations as time goes on, but it is well for us to contemplate such evidence as is at our disposal of our enemy's conception of the possibilities.

Our meatless days and wheatless days and lightless nights are established, but we are still to an extent indulging in the workless day. We have seen Congress appropriate nineteen billions of dollars for war purposes, but the real problem is not dollars. The real problem is things—manufactured things. All the money the government ever spent from the first day of its foundation down to the beginning of this year, during all the wars and all the times of peace, foots only twenty-six billion dollars, and there is demanded from labor and from workshops a substantial part of nineteen billions in twelve months. The obvious conclusion is that labor must be released at once from

making all the things it has been making for our comfort, for our pleasure, for our luxuries, and be freed for the work the government wants done. And a considerable part of the work the government wants done is the work of the soldier, which is the consumption, not the production, of the things required. We will conserve materials, of course, but for the sake primarily of conserving labor, because with labor in plenty, there is coal, iron, copper, and although subject to other restrictions, foodstuffs to be had in any quantity the necessity demands.

Lest you consider it needless to reiterate all these common qualities of the gospel we are accepting, they are presented in review because it is necessary that we develop a patriotic response to our efforts from our fellow employees. Each member and all of the members together of an organization must know the cause and feel that it is a common cause, and that labor is now employed, under conditions more remotely removed from consideration of profit and compensation than ever before. The man who employs labor will feel the sense of responsibility that goes with a trust. He must use it without waste to the best advantage or be considered a slacker.

We have, then, a responsibility to examine our business, that comes from a higher source than the convenience or interests of the individual or the business itself. We are under obligation to examine the common elements of our affairs to see if courses of action will be suggested that we may employ. Some wholesale methods will be established to which all will be subjected, but the conservation of labor may be essentially the retail application of conservatism by those who have relatively small quantities at their direction.

In considering changes that might involve an altered character for our business of distributing electrical supplies as jobbers, we must not forget that we might lose our business when we lose our character. We know the jobber to be a convenience and worthy of hire, but we will be worthy and paid just so long as we perform our service. Our service, therefore, must be in its essentials preserved.

Clerks, bookkeepers, stenographers, messengers, are all laborers whose time is the precious commodity we have in trust.

System planted in any business is self-sustaining and self-developing, and grows like a tree, producing branches on which fruit for a time appears, but is later shaded from the light and becomes a useless drain on expense. The gardener trims such useless growth away. An examination of the systems we employ will develop some clerical work that at one time gave us results but is being continued without benefit. This is

particularly true of periodic statements of certain conditions of our business. The bookkeeper has been asked to make up a statement the use of which he does not entirely comprehend. The sales manager sees it week by week or month by month, and passes it along to another who has long since lost all interest in it.

Then there is work that has an apparent value, but of which we may properly dispense at this time. Perhaps an elaborate acknowledgment of an order may be made simple or done away with entirely. We may have made a practice of itemizing a statement balance beyond the current month. There are some who are advocating now that statements be dispensed with altogether, as most buyers pay individual bills, and often merely a report of a balance would permit of sufficient check as between accounts. This might at least be done with some of our largest customers. Remittances are made without expectation of acknowledgment or receipts. A style of correspondence can be developed that works automatically to produce short, concise letters and eliminate words and phrases like "beg to advise" and "beg to remain" and complimentary expressions. While we are going to be as courteous as ever, something more than has been the usual practice will have to be taken for granted. An executive once observed that he had succeeded in getting through a week and writing but three letters, and that when he read those three letters later he found that he could have dispensed with two.

There will be many by-products of value incident to this war, and not the least will be a substantial disposition toward thrift. The discipline to which we will have been subjected will make us more economical of our substance and our time. Every member of our organization will be more amenable to reasonable restrictions which will be made to reduce those daily periods of relaxation called loafing. Soldiering will describe hard work. If we have ever had a mistaken hesitancy about the maintenance of a reasonable strictness, the benefits that we will now observe resulting from discipline will convince us that organizations of whatever character are happier, more contented, and with less friction and misunderstanding, when subject to a proper and reasonable discipline. A direct result will be the elimination of some wasted time.

We have already referred to our office system as a growth that at proper seasons benefits by pruning. But action will follow examination, and for our purpose examination frequently requires the separation of a job or a man's work into its essential parts. Every ambitious man absorbs more and more work as he gains knowledge and experience. The measure of this capacity usually determines his compensation and he knows it. Consequently, he and many of his associates will be found to have assumed a burden of easy routine work that could be undertaken by less expensive and perhaps inexperienced help. When there are changes in our organization and men leave for the country's service, we will try by a detailed analysis of the jobs to determine if the work of say two experienced members, of which we are losing one, cannot be carried on by the one of experience and two beginners, and for the beginners we may be able to substitute women. All prejudice against women at work has disappeared and we are astonished at the tasks undertaken. It is

no uncommon sight to see girls running elevators, and a railroad company has set thirty or more women sorting junk, the very heaviest sort of manual labor, and while perhaps the demand at present exceeds the supply of women help, the supply will be augmented by the special incentive at this time for women to go to work, and further, necessity will compel many to undertake their own support or assist in the support of their family.

A great variety of office appliances has been developed and many classify as time savers. We are all committed to the typewriter with its carbon copies, and are becoming converted to the graphophone and duplicating apparatus. While it pains us to see a modern clerk turn to an adding machine to foot up two or three figures, still he may be right, because his answer is sure to be. There are envelope openers and stamp fixers, pencil sharpeners, and other ingenious tools, both for the office and warehouse, on which labor has been expended, awaiting to be exchanged for money, of which we have plenty, to do a part in the reduction of the labor required to keep systems and work going. Maybe your bookkeeper has been asking you to buy some of these things.

It is human nature that labor's ideal should be better wages and shorter hours. Both have been possible as better production methods have been developed, but this ideal must take a place further back at least temporarily, if there is to be labor sufficient to go around. Longer work hours will be observed, but as the day's work is lengthened we will do well to guard against the effects of irregular hours. Indiscriminate and irregular overtime on office work is usually productive of confusion. It is doubtful if the work as a whole is set much further ahead. It has been observed in numerous cases that the condition of an office badly behind in its work and addicted to irregular overtime could be re-established merely by orders to cut out the irregular hours. Longer hours will come probably by having the day start earlier in the morning. For some classes of help, of course, work hours are established by law.

We are working between ourselves so free an exchange of stock, not in quantities large but in articles and transactions numerous, that at some centers it would seem that our efforts tended to introduce something expensively better than a reasonably standard service. If we could organize an exchange that would hold forth for an hour or two each day, perhaps by telephone, we might possibly be able altogether to save a considerable amount of time and effort without inconvenience to our customers.

It is not impractical to expect that our customers—the buyers—will work with us to conserve labor. We may be privileged to ask that they help us eliminate wasteful occupation. They should be more disposed to mail in an order to the house of their selection, rather than wait several days for a salesman's call and then demand some emergency service because of the delay. Individual standards will make way for general standards. The buyer who has standardized on some piece of special equipment should not use the pressure of his buying power to dope longer life into his specialty, but should quickly accept the standard substitute.

WHAT WESTERN INVENTORS ARE DOING

(You cannot issue your own patent plus an improvement if another man has received a patent on the addition. Protection against infringement is afforded by the knowledge of how to word your claim wisely. As technicalities of patent law are involved, this lucid article by well-known authorities on the subject should be studied carefully. The authors are prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

BY WM. K. WHITE AND H. G. PROST

In the preceding issue we discussed the various claims which one, Jones, might have been granted on a chair which involved the use of casters, it being assumed that Jones was the first in the art to apply casters to the legs of chairs. We will now continue with our hypothetical case and discuss the relation of an improved construction to the Jones patent.

Improvement Patent

Let us assume one, Smith, improves on Jones' invention by adding anti-friction rollers to the casters attached to the legs of a chair and that such rollers are provided with ball bearings. Smith would be entitled to a patent on his improvement and could word his claims thereon, as follows:

Generic claim: In combination, a chair, casters attached to the legs thereof and anti-friction rollers applied to said casters.

Specific claim: In combination, a chair, casters attached to the legs thereof, anti-friction rollers applied to said casters and ball bearings for said rollers.

Infringement by Use of Patented Improvement

Smith, without a license from Jones under the Jones patent, could not lawfully make, use or sell a chair embodying the Smith improvement, because, in so doing, he would infringe the prior Jones patent covering a chair + casters. In other words, Smith, in order to use his own invention, embracing a chair + casters + anti-friction rollers, would be compelled to use the Jones invention embracing a chair + casters. However, the prior Jones patent grants to Jones the right of preventing all others from making, selling or using a chair + casters and, therefore, Jones, under his patent, could enjoin Smith from making, using or selling a chair + casters + anti-friction rollers.

On the other hand, the subsequent Smith patent grants to Smith the right to prevent all others from making, using or selling a chair + casters + anti-friction rollers. Therefore, Smith could enjoin Jones from adding anti-friction rollers to the Jones patented combination of a chair + casters.

Nature of Patent Monopoly

The foregoing illustrates the fact that the grant of a patent is not the grant of the right to make, sell to use devices embodying the invention covered by the patent. The right, granted by a patent, is only the right of preventing all others from making, selling or using devices embodying the invention covered by the patent.

Smith would not have the right to embody his own patented improvement in a chair structure until after the expiration of the Jones patent giving Jones the monopoly of two of the elements employed by Smith in Smith's improved device.

Until after the expiration of the Smith patent giving Smith a monopoly of anti-friction rollers used with the combination of a chair + casters, Jones would have no right to apply such anti-friction rollers to the Jones patented combination of a chair + casters.

Reason Why Infringement Not Considered by Patent Office

The foregoing situation illustrates the reason why the Patent Office does not consider the question of infringement in passing on an application for a patent.

The patentability of Smith's improvement on Jones' prior patented invention does not depend on whether or not such Smith improvement can be made, sold or used without infringing Jones' patent. If the Smith improvement is novel, useful and the product of an inventive act, Smith is entitled to receive a patent thereon.

The granting of such a patent to Smith does not conflict with the monopoly granted by the Jones prior patent. Jones is still free to make, sell and use the combination of a chair + casters. The Smith patent monopoly merely enables Smith to prevent Jones and everyone else from adding anti-friction rollers to the Jones combination.

Let us assume Smith inserted, in his application, the following claim:

"In combination, a chair and casters attached to the legs thereof."

In considering the novelty of such claim, the examiner would search the prior art and run across the prior Jones patent. On finding disclosed in the Jones patent, the combination of a chair + casters, he would reject such Smith claim on the Jones patent, as the same shows Smith was not the first one in the art to combine a chair and casters, and, therefore, was not the original and first inventor of such a combination.

However, the Jones patent would not prevent Smith from securing a claim covering the combination of a chair + casters + anti-friction rollers, because Jones does not disclose any anti-friction rollers in his patent. The fact that the Jones patent claims the combination of a chair + casters does not affect the novelty of Smith's combination of a chair + casters + anti-friction rollers.

Value of Improvement Patent

The fact that Smith cannot lawfully make, sell or use his patented improvement does not necessarily make his patent valueless. If Jones wishes to use anti-friction rollers, in the Jones patented combination, he may be willing to either purchase the Smith patent or take a license thereunder from Smith on a royalty basis. On the other hand, Smith may be able to purchase the Jones patent or take a license from Jones, and thereby be in a position to lawfully exploit his own patented improvement. A third party may be

willing to purchase both patents in order to exploit the inventions, respectively covered by them.

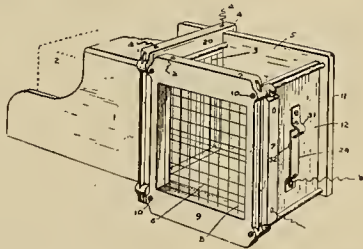
Exemplar Claims Considered in Light of Other Patent Law Principles

As heretofore stated, the foregoing claims are not intended as correct examples of all patent law principles. For instance, the validity of the claim for a chair + casters might be attacked on the ground that no invention was required to first apply casters to a chair. Assuming that casters had been previously applied to a table, the subsequent application of casters to a chair might be adjudged a mere "double-use" or more extended use of casters and the courts usually hold that such a mere "double use" of a device does not amount to invention. The validity of the claim for a chair + arms and therefore + casters might be attacked on the ground that there was no co-operation between the arms and casters and, therefore, the claim was for a mere aggregation of elements and not for a true patentable combination. The claim for a chair + casters + anti-friction rollers + ball bearings might be rejected by the Patent Office on the ground that the real invention was an improved form of caster, adaptable for use with various articles and, therefore, the chair should not be made an element of the claim.

NEW IDEAS FROM THE WEST

Electric Ice Cutter

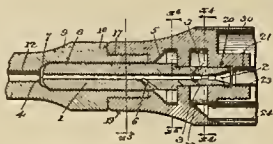
Patent No. 1,250,010, issued to Germain Ponchan of San Francisco, discloses a novel form of machine for cutting a block of ice into cubes for use in hotels and restaurants. The machine consists of two sets of vertically arranged electrically heated wires arranged at right angles to each other. One set consists of a series of vertical wires against which the block of ice moves and these wires cut the block into slabs. The other set consists of vertical and horizontal wires against which the slabs move sidewise, and by which they are cut into



cubes. The block of ice is placed on an inclined chute so that it is pressed by gravity against the first set of hot wires. After having passed through these wires the slabs press a switch which opens the circuit through the first set of wires and closes it through the second set of wires, and the slabs are pressed by gravity against the second set and are cut into cubes.

Apparatus for Connecting Service Wires to Charged Main Wires

Patent No. 1,249,898, issued to Hazel Burton Bush of Redlands, California, discloses an apparatus whereby a service wire may be properly and safely connected to a live feed

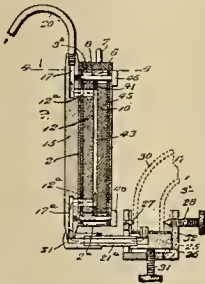


wire. The apparatus consists of a rotatable head having a slot therein to receive the feed wire and having a jaw thereon for gripping the end of the service wire. The head is pro-

vided with an insulating handle so that the apparatus may be manipulated without danger. The service wire is fitted into the jaw and the head slipped over the feed wire. The head is then rotated, causing the end of the service wire to be evenly and tightly coiled around the feed wire to produce a tight connection, after which the head is released from the feed wire, leaving a service connection.

Electric Water Heater

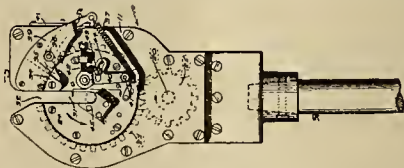
Patent No. 1,249,285, issued to Milton H. Shoenberg of San Francisco, and assigned to the Majestic Electric Development Company, discloses a novel form of instantaneous



electric water heater. The heater comprises a casing in which is arranged two spaced carbon electrodes which are separated by a marginal insulating packing, whereby a chamber is formed between the electrodes. One of the electrodes is provided with inlet and outlet water passages opening into the chamber, so that the water to be heated passes through the chamber, wherein it is heated by the current passing through it from one electrode to the other.

Gas Burner

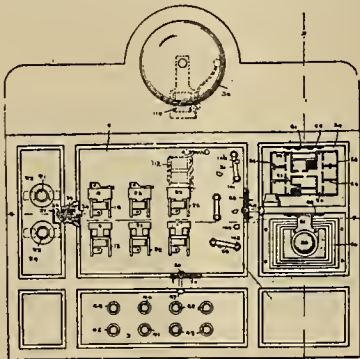
Patent No. 1,248,895, issued to Carl J. Nyquist of Los Angeles, California, shows a gas burner which is constructed to prevent a flash back into the gas pipe. This is accomplished



by providing a chamber within the burner which is large enough to contain sufficient gas to produce an explosion in the event of a flash back, and this chamber is so connected with the gas passage in the burner that the explosive gases are directed toward the end of the burner, whereby the flame is blown out and a flash back into the pipe prevented.

Combined Fire Alarm and Annunciator

Patent No. 1,249,717, issued to John Carrigan of Seattle, Washington, discloses a novel form of combined fire alarm and annunciator. This device comprises a plurality of drop



annunciators, a testing button for each drop, and a reset magnet for the drops. A gong is included in the device and means are provided for cutting the gong in or out of the annunciator circuit, so that the device may be used as a fire alarm when desired.

SPARKS—Current Facts, Figures and Fancy

(The steady increase in the use of electricity and the discovery of new applications, from milk sterilization to the heating of hospital beds, continues in spite of rulings everywhere for the reduction of fuel consumption for other than war purposes. Greater efficiency in the utilization of our energies rather than a cutting down of their consumption, is the great message of economy which the war is driving home.—The Editor.)

The electric flat-iron now keeps union hours. Owing to the necessity for conserving electric power for war service, the province of Turin, France, has forbidden the use of electricity for any domestic purposes between the hours of 7 a. m. and 8 p. m.

* * *

Electric canoes are becoming very popular on the upper Thames. The most modern electricians are equipped with steering wheels, operating a three-bladed propeller through a pinion and a ratchet. A 30-cell battery, the usual capacity for one day's run, is commonly used.

* * *

A revolving searchlight, flashing the national colors through electric nitrogen lamps, aggregating 275,000 candle power, is the boast of Spokane. The rays of the light, which flash intermittently from dusk until midnight, can be seen for twenty miles in any direction on a clear night.

* * *

The Portland street car conductor's lot cannot be a very happy one. The Public Service Commission has allowed an increase of fares to six cents, and passengers are demanding a receipt when they pay the extra cent, so that they may recover if the Supreme Court fails to sustain the higher rate.

* * *

Persistent trouble on a telegraph line near Eugene, Oregon, has at last been traced to the short-circuiting of insulators by soot. The wires ran through a 4,800-foot railway tunnel, and it has been found that the smoke from the locomotives has gradually coated the insulators with soot until they are no longer non-conductors.

* * *

Electricity is proving its value in war as well as in the arts of peace. Electrically heated beds have been found of advantage in the treatment of shock at field hospitals, and for military purposes it will be seen that the current required may be instantly supplied from a portable dynamo driven by a motor lorry or car attached to a field hospital.

* * *

By exporting electricity, Sweden has somewhat relieved the fuel shortage in Denmark. Although they are arranging to lay additional cables across the sound, with the intention of furnishing the street-car service of Copenhagen and Frederiksberg with a large amount of power, the difficulty in obtaining copper cables and electric transformers is delaying this work.

* * *

Brick as a building unit dates back to very early times. The first bricks of which there is authentic record were found on the sites of the ancient cities of

Babylonia, dating back as far as 3400 B. C. In America, Virginia hands down to us, along with some of our most cherished history and tradition, a record of the first brick manufactured on this continent, in 1611.

* * *

A miniature electric lighting plant modeled in wax, to be used by an industrial exhibit at Tacoma, Washington, reproduces not only the power plant but the river from which it derives its power, the mountains, and the river canyon, where the headworks will be shown. The miniature river will be lighted with scores of tiny Mazda lamps placed beneath the water.

* * *

It is necessary not only to have sugar to eat, but also to see by, as was developed by the recent sugar shortage of the East. It seems that brown sugar is used in infinitesimal amounts in the manufacture of electric globes, and officials of one of the large lamp companies appealed to Federal food authorities for 35 pounds weekly of brown sugar, stating it would be necessary to suspend operations in the company's plant unless the request was granted.

* * *

"Music that is visible" was recently inaugurated at a concert at the Greenwich Village Theatre, at which electric lights were used to give the related atmospheric setting to the compositions. Debussy's prelude in A minor, for instance, was accompanied by a rainbow thrown upon a background of neutral curtains. The "Soiree dans Grenade" was realized in amber and pink, and the "Poissons d'or" in green. The house was dark and the pianist invisible.

* * *

The life of the operator is absolutely dependent upon the strength of construction in an aeroplane—as well as with so many of our great electrical machines. One faulty part may lead to fatal results. To secure this strength, over four thousand nails, some thirty-two hundred feet of wire, and three thousand three hundred-odd screws are put into the assembling of a single aeroplane.

* * *

Germs, like human beings, are susceptible to electric shocks, and when a current passes through their minute bodies they succumb to heart failure. This fact has been used in a series of experiments carried on by a group of scientists in Liverpool, England, to test the possibilities of the sterilization of milk by electricity. They have passed the alternating current through the milk with the object of discovering whether the sterilization which results is due to electrolytic dissociation in the neighborhood of the electrodes. Sufficient progress has been made with the experiment to encourage the committee to proceed further.

PERSONALS

Mark L. Requa, who has been appointed oil administrator for the nation, is a capitalist and mining engineer of San Francisco and Oakland. Mr. Requa for many years was prominent in the oil-producing industry of California. Because of his combination of practical experience in oil production and distribution with technical knowledge gained by his professional education for engineering, he for some time has been consulting engineer of the Bureau of Mines, with rank as a specialist in oils. His professional status may be inferred from

the fact that he is a vice-president of the American Institute of Mining Engineers and a member of the Mining and Metallurgical Society of America. The vital part which fuel oil plays in the generation of electricity in the West makes Mr. Requa's appointment particularly important to the electrical industry.

Lamar Cobb, Phoenix, Arizona, has been appointed state engineer of Arizona, succeeding Thomas Maddock, resigned.

Louis A. McArthur, general manager of the Pacific Power & Light Company of Portland, is a recent San Francisco visitor.

J. O. Broili, electrical engineer at Reno, Nevada, was recently appointed chief engineer for the Nevada Public Service Commission.

Sidney R. Inch has succeeded C. E. Groesbeck as vice-president and general manager of the Utah Power & Light Company at Salt Lake City.

J. E. Poingdestre, after serving twelve years as manager of the Marysville, Cal., branch of the Pacific Gas & Electric Company, resigned recently.

George C. Holberton, San Francisco manager of the Pacific Gas & Electric Company, is secretary of the Association of Edison Illuminating Companies.

B. G. McBride, manager of the Elko-Lamoile Power Co. at Elko, Nevada, has gone to Washington, D. C., to take an examination for captain in the U. S. Army.

E. H. Eardley of Salt Lake City, Utah, secretary of the Utah Society of Electrical Contractors and Dealers, was recently in San Francisco on business for a few days.

W. M. Fraser, electrical superintendent of the British Columbia Electric Railway, Ltd., of Vancouver, B. C., has been given full charge of the operating end of the business.

F. S. Easton, hydro-electric engineer of the British Columbia Electric Railway, of Vancouver, B. C., has been given full charge of the power-producing plants of the company.

V. S. McKenny, local manager of the NePage-McKenny Co., is back from New York and taking hold of the large amount of business which that company now has under construction.

P. H. Ridgway, electrical and mechanical engineer of Seattle, Wash., was some time ago commissioned captain of Engineers, U. S. R., and is anticipating orders to report some time this month.

F. J. Zorn, Seattle manager of the Pacific States Electric Company, attended the quarterly meeting of the Pacific Coast Section of the Supply Jobbers' Association, held at Del Monte, Cal., January 24, 25 and 26.

F. S. Pratt, of Boston, an official of the Stone & Webster concern and chairman of the board of directors of the Puget

Sound Traction, Light and Power Company, recently visited Seattle on business matters.

Raymond W. Murphy has been transferred from the Pacific Coast offices of the Westinghouse Lamp Company, to the Philadelphia office, where he will hold the position of assistant manager.

L. C. Bewsey, formerly superintendent of the Buffalo, Lockport & Rochester Railway, at Rochester, N. Y., has accepted a position with the Manila Electric Railway & Light Company, of Manila, P. I.

C. E. Groesbeck has resigned as vice-president and general manager of the Utah Power & Light Company at Salt Lake City, to assume executive duties with the Electric Bond & Share Company at New York City.

E. C. Johnson, superintendent of the Pacific Gas & Electric Company at Marysville, Cal., has been named manager of the company, succeeding J. E. Poingdestre. Mr. Johnson will now assume the duties of both offices.

G. H. Jameson, manufacturers' agent, Mercantile Building, Vancouver, B. C., returned November 24th from a trip to northern points, the itinerary covering the pulp and paper plants at Powell River, Swanson's Bay and Ocean Falls.

S. E. Vance, of the state engineer's office, Idaho, who has been in charge of the distribution of the stored water in Jackson Lake, Wyoming, to the Twin Falls, has recently entered in the Twenty-third Engineers' Highway Regiment.

J. I. Brown has resigned as general manager of the Nevada Valleys Power Company. The company's offices have been transferred from Oakland, Cal., to Lovelock, Nevada, with Joe Beane in active charge as general superintendent.

H. B. Jones has been brought to Astoria by the Pacific Power & Light Company to investigate the problem of providing facilities for taking care of the power demands of the territory, and he has spent the past three months working on the matter.

Milton Rupert was recently elected vice-president and assistant treasurer of the R. D. Nuttall Company of Pittsburg, Pa., manufacturers of gears, pinions and trolleys. In his new position, Mr. Rupert will have charge of sales and manufacturing activities.

John Harisberger, general superintendent of the light and power department of the Puget Sound Traction, Light & Power Company, and chairman of the Seattle Section of the American Institute of Electrical Engineers, has received a captaincy in the Engineers' Officers' Reserve Corps.

G. W. Hawkins, power engineer for the firm of Andersen, Meyer & Co., Ltd., of Shanghai, was a passenger on the last Empress liner to leave Shanghai for America. This trip is taken in connection with a large contract for electrical supplies which he recently closed on behalf of his firm with a Chinese electric company in Canton, South China. Mr. Hawkins is expected back in Shanghai next March.

A. L. Spring, Southern California field representative for the co-operative educational campaign of the commercial section,

Pacific Coast Section, N. E. L. A., was a recent attendant at the Sacramento quarterly gathering of the California Association of Electrical Contractors and Dealers. Mr. Spring later briefly addressed the weekly gathering of the San Francisco Electrical Development League. This splendid original campaign of co-operative education among all the branches of the electrical industry is receiving substantial backing from every quarter,

and the best wishes of the West go with Mr. Spring in his endeavors.



A. S. Hall, formerly district manager of Pacific Power & Light Company at Pasco, Wash., is now captain in 56th Engineers at Washington, D. C. The regiment is largely composed of central station men and is known as the Searchlight Regiment.

Roy Page, formerly in the office of the electrical engineer of the Southern Pacific Company, who went to Omaha last summer to the Nebraska Power Company, has been appointed assistant to Vice-President and General Manager J. E. Davidson of that company.

Guy A. Richardson, superintendent of Railway, Puget Sound Traction, Light & Power Company, Seattle, has returned from the East, where he went to make a traffic and transportation study of the problems confronting the American International Shipbuilding Corporation at Philadelphia.

F. H. Newell, for many years director of the Reclamation Service, has been selected by the President to be executive officer in charge of water-power development. Under the terms of the new Administration water-power bill, soon to be considered, this proposed position carries a salary of \$10,000 a year.

Gerard Swope, vice-president of the Western Electric Company, will be given the Fourth Order of Merit, with the Minor Cordon of the Rising Sun, by the Emperor of Japan. The decorations are awarded, it is stated, in appreciation of services rendered toward the advance of the electrical industry in Japan.

A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, is rendering able service on the advisory board for the co-operative educational campaign now under way in California by the commercial section of the Pacific Coast Section, N. E. L. A. To this end his presence in San Francisco and Los Angeles of late has been frequently noted. Meanwhile his energies in behalf of



his company are not suffering. Here he is on the right of the picture in which he is shown with J. B. Carter, district agent of his company for the west side oil fields of Kern county, seated upon a pile of pipe casing watching an oil well being driven by electricity.

H. B. Pickering, manager of the Foundation Company's Tacoma plant since its location there, has been appointed engineer of construction for the company and will be assistant to Bayly Hipkins, district manager of the concern. Mr. Pickering will supervise all the construction at the Portland, Tacoma, and Victoria, B. C., plants.

Chas. T. Main, of Boston, president of the American Society of Mechanical Engineers, has designed and supervised the construction of numerous industrial, steam power, and water power plants. Among the larger of his undertakings are four hydro-electric developments for the Montana Power Company, aggregating about 280,000 horsepower.

Hugh L. Cooper, hydraulic engineer, who made Spokane his headquarters at one time, and who holds an option on the Z Canyon water-power site on the Pend Oreille river below

Metaline Falls, is now in France and holds a commission as lieutenant-colonel in the American army. He is in charge of important construction work.

G. A. Strain, formerly general manager of the gas department for the Helena (Mont.) Light & Railway Company, one of the J. G. White Management Corporation properties, has recently been promoted and will have charge of five gas plants in the East operated by the White corporation. Mr. Strain has been in Helena about ten years.

W. H. McGrath, vice-president of the Puget Sound Traction, Light & Power Company, has been made Washington state representative of the traffic committee of the American Electrical Railway Board with offices in Seattle. He is co-operating with the King County Council of Defense in solving the problem of transportation of shipyard workers to and from their places of employment.

W. S. Ford, Lieutenant, Royal Garrison Artillery, 122nd Siege Battery, B. E. F., who has been elected an associate member of the Canadian Society of Civil Engineers, was formerly assistant hydraulic engineer with the Canadian Boving Company, designing water power plants, Diesel engine plants, etc., and also with the Western Canada Power Company, Stave Falls, B. C., on power house construction, waterways, surveys, etc.

A. C. Houston has taken charge of the Yolo Water and Power Company as president to succeed Olaf Ussing. Mr. Ussing had accepted, temporarily, two weeks ago, when W. G. De Celle resigned. L. J. Shuman will be general manager, and is making arrangements to move here from Lakeport, Lake county. Mr. Shuman has been in charge of the Lake county division of the company.

P. M. Downing, chief engineer of the hydro-electric department of the Pacific Gas & Electric Company, has been appointed manager of operations for the tying-in and joint operation of the three large hydro-electric companies of Central California—The Pacific Gas & Electric Company, The Great Western Power Company, and the Sierra and San Francisco Power Company. This interconnection will probably serve more square miles of territory under one management than ever before attempted in hydro-electric practice.

Max Thelen, president California Railroad Commission, has inaugurated the University of California extension course on public utility problems. This university extension course is open to all and is directed especially to lawyers, bankers, officials and employees of public utilities, city and county officials and others particularly interested in problems of regulation of public service corporations, and in the way in which they are being worked out by the commissions. Commissioner E. O. Edgerton gave the lecture on the evening of January 23, 1918.

Captain H. A. Kluegel, who is superintendent of buildings and grounds at Camp Lewis, will be connected with the staff of Major John Coffee Hays, in charge of the utilities at the camp. Captain Kluegel left his practice as consulting engineer in San Francisco to take up his work for the government. He has been identified with many large projects on the Pacific Coast and was chief engineer of construction on a South American railway. For five years he was associated with Major Hays in the construction of power plants in California as chief engineer of the Mount Whitney Light & Power Company.

W. R. Bonnycastle of Vancouver has been elected a member of the Canadian Society of Civil Engineers. He is in practice as a consulting hydro-electrical engineer, specializing on water power development, and is also engineer for the Bridge River Power Company and the Indian Power Company, B. C. Besides being connected with Mr. R. S. Kelsch, of Montreal, on the design of the Kaministiquia Power development, Fort William, Mr. Bonnycastle was electrical engineer with the Stave Lake Power Company, designing engineer with the Western Canada Power Company, and engineer for Smith, Kerry & Chace.

MEETING NOTICES FOR ELECTRICAL MEN

(Plans for the spring convention of the Pacific Coast Section, N. E. L. A., are nearing completion, and are here given in detail. An interesting meeting of the San Francisco Development League, which brought architects and electrical men into closer touch, was a major event of the two weeks period. Reports of an important Agricultural and Engineering Conference in Idaho, and a meeting of the League of the Southwest in Arizona, as well as other local gatherings, follow.—The Editor.)

The San Francisco Electrical Development and Jovian League

The League meeting for Wednesday, January 16, 1918, at the Palace Hotel, was devoted to a discussion of future league policies. It was the overwhelming sentiment of the meeting that the league divorce itself from the Jovian Order, not with any reflection upon that order, but that an open forum might thus be provided where jobber, contractor, engineer, central station man, members of the A. I. E. E., N. E. L. A., and other associations, might discuss problems before an open body without any affiliations whatsoever. The proposed new constitution is to be found on another page of this issue.

On Wednesday, January 23, 1918, was held Architects' Day, which proved perhaps the most helpful of all the helpful meetings of the season. Louis C. Mullgardt, designer of the Court of the Ages at the P.-P. I. E., and B. R. Maybeck, designer of the Palace of Fine Arts at the P.-P. I. E., John J. Donovan, architect of the City of Oakland; H. C. Reid, president of the California Association of Electrical Contractors and Dealers; H. P. Pitts, of the industrial department of the Pacific Gas & Electric Co.; and Sylvain Schnaittacher, secretary of the American Institute of Architects, all spoke, presenting new and helpful ideas. The gist of the discussion was that the league should father a movement to present electric data to the architect in a more brief and unified form and that electric inspection for safety, fire and other matters should be made clearer in interpretation to the architect.

Joint Conference of Agricultural, Engineering and Irrigation Societies of Idaho

A convention of unusual interest recently held in Idaho was known as the Joint Conference of Agricultural, Live Stock, Engineering, and Irrigation Societies. More than twenty-five of the food-producing organizations which hold annual meetings in different parts of the state, arranged to gather during the week of January 14-19, inclusive, in Idaho Falls. Sectional meetings were held by the different societies in the afternoons, while the mornings and evenings were given over to hearing important agricultural, live stock, engineering, and irrigation messages from government experts, who were brought at the expense of the conference.

Two of the important features of the conference were the annual meetings of the Idaho Society of Engineers and the holding of the annual Irrigation Congress. Leading engineers and irrigationists of the state had the programs in charge. At the Irrigation Congress Chairman R. E. Shepherd, of Jerome,

Idaho, extended the official welcome. John H. Lewis, state engineer of Oregon, talked on "Water Control in Oregon." Prof. S. T. Harding, of the University of California, was scheduled to address the meeting on "Duty and Function of Irrigation Water." "Hydrometric Work" was the subject of Lynn H. Crandall, of Jerome. Experts also discussed "Transportation by Truck Lines."

Telephone and Telegraph Society

At the meeting of the San Francisco Section, Telephone and Telegraph Society of the Pacific Coast, on January 24th, Lieutenant Comte de Mailly Chalon, aviator of France, spoke on "The War in the Air." Lieutenant de Mailly Chalon has recently been sent by his government to Russia, where he has been developing airmen for the Russian Army, and he is now returning for further service in France.

League of the Southwest

At the recent meeting of the League of the Southwest, at Tucson, Arizona, C. E. Grunsky of San Francisco, consulting engineer for the Imperial Irrigation District, urged the establishment of state boards to investigate irrigation projects, and to recommend them when found worthy, and the centralization of the engineering work of the various departments of the government under one head for public works.

The league resolved to recommend that the national government have a study made of the entire Colorado River drainage basin, with a view to selecting necessary and feasible sites and constructing and operating the works required to conserve and utilize the flow of river,

and to reduce the annual flood menace.

It was recommended that negotiations be opened with Mexico for a revision of the present treaties and agreements in such manner as to allow a just apportionment of water for irrigation purposes and flood control on both sides of the international boundary, and that the continued disuse of the lower river for navigation purposes be recognized and all such rights be abrogated.

Engineers' Club of Oakland

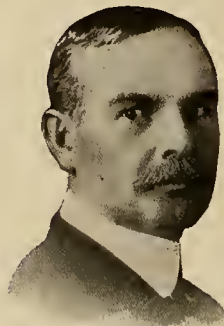
On Wednesday evening, January 16th, in the Commercial Club, Hotel Oakland, George A. Posey, C. E., Chief Deputy County Surveyor, spoke before the Engineers' Club of the Oakland Chamber of Commerce on "The Oakland Estuary Bascule Bridge."

Jobbers' Meeting

The annual meeting of the Pacific Coast Section of the Electrical Supply Jobbers' Association was held in Del Monte, January 24th to 26th.

W. S. Berry, manager of the San Francisco district of

BUILDERS OF THE WEST—XXII



JOHN D. RYAN

The electrification of a transcontinental railway over the Continental Divide has not only thrilled the entire world with a new and romantic field of usefulness for electrical energy, but the economies that are daily being brought to life from operating statistics fully bear out the sound thought of the constructive mind that planned the original conception for transcontinental railway electrification in the West. To John D. Ryan, financier and builder with the Montana Power Company, this issue of the Journal of Electricity is dedicated as a lasting memorial to his contribution to the upbuilding of the West.

the Western Electric Company, was elected chairman for the ensuing year to succeed Colonel Sam Taylor.

The many new problems arising from present abnormal conditions occupied the time devoted to meetings. Mr. E. J. Wallis of the Western Electric Company presented a paper on "The Obligation Entailed by the Present Demand for Labor, and Some Suggestions on Ways and Means of Conserving Labor," which proved of such interest to all that we have pleasure in publishing it in this issue of the Journal for the benefit of our readers.

D. E. Harris, sales manager of the Pacific States Electric Company, in the proud holder of the jobbers' copper golf cup for the next quarter, and J. A. Vandergrift of the National Lamp Works is temporary guardian of the Turner trophy. H. B. Squires modestly accepted the manufacturers' cup in a short but pithy speech.

The next meeting of the association will be held at Del Monte in April in conjunction with the Pacific Coast Section of the N. E. L. A. and the California Association of Electrical Contractors and Dealers.

The Del Monte Convention of the Pacific Coast Section, N. E. L. A.

A meeting of the convention committee of the Pacific Coast Section, N. E. L. A., under the chairmanship of Robert Sibley, editor of the Journal of Electricity, met at the San Francisco Engineers' Club on Monday, January 21, 1918. This central committee, composed of representatives of the jobbers, the contractors and the central stations, has complete charge of arrangements for the convention. Practically all members of the committee as announced in the issue of the Journal of Electricity for January 15, 1918, were present, with the exception of the members from Southern California. The next meeting is called for Friday noon, February 8, 1918, at the Engineers' Club, at which permanent subdivision of work will be made. At a later date it is planned to hold a meeting in Los Angeles so that arrangements for the convention from that part of the state may be perfected, in case these men cannot attend the meeting in San Francisco on February 8th.

The plans thus far outlined are broad and comprehensive. The convention is to be called to order at the Del Monte Hotel, Wednesday, April 24, 1918, at 2:30 p. m. This first session will be devoted to the president's address and general

business and executive affairs of the section, and report of the auditing committee. All day Thursday will be given over to a discussion of war emergency engineering under the auspices of the engineering committee, J. E. Woodbridge, chairman. Throughout Friday, the sessions of the convention will be given over to war emergency discussion by the commercial section, R. M. Alvord, chairman.

On Wednesday evening the formal ball will take place at the Del Monte Hotel. Thursday evening will be devoted to dancing and other recreations. Friday evening will be the banquet. Saturday morning will be a golf tournament and out-door sports for men and women guests. The afternoon of Saturday will be taken up with autoing through the seventeen-mile drive, with a wind-up for dinner at the Carmen Highlands.

Special trains will run from both Los Angeles and San Francisco. The entire affair is receiving the enthusiastic support it deserves, since the proposed war discussions are recognized as timely and of great present value to the industry.

The work of the convention committee, under the general direction of the chairman, is divided up as follows, and no other committees or apportionments of duties have been authorized:

Entertainment—R. E. Fisher, Pacific Gas & Electric Co.

Reception—R. F. Behan, Westinghouse Electric & Manufacturing Company.

Program—J. W. Redpath, California Electrical Contractors' Association.

Banquet—T. E. Bibbins, Pacific Electric Company.

Finance—M. A. DeLew, California Electrical Contractors' Association.

Out-door Sports—W. S. Berry, Western Electric Co.

Registration—H. P. Pitts, Pacific Gas & Electric Co.

Automobile—H. C. Reid, Pacific Coast Fire Extinguisher Company.

Transportation and Hotel—W. M. Deming, Journal of Electricity.

The members of the committee from Southern California will be asked to organize and work jointly with these several committees. Additional activities of the convention committee will be published in this column in subsequent issues of the Journal of Electricity.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.
Next meeting—February 12. Speaker: J. F. Wilson, University of Southern California, on "Tendencies in Design of Generators."

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
February meeting—February 16th.

San Francisco Section

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.
Next meeting—February 22.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
Next meeting—February 15. Subject: "Distribution of Electricity."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS**National Association of Electrical Contractors and Dealers**

President—Col. Robley Stearnes, New Orleans, La.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Directors—California: W. D. Kohlwey, San Francisco. Oregon: Samuel C. Jaggar, Portland.
Next Convention—Cleveland, July 17-20.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th,

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—Allen S. Halls, 517 Railway Exchange Bldg., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS**Electrical Supply Jobbers Association**

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST**National Electric Light Association**

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next meeting—Del Monte, April 24-27, 1918.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.
Next meeting—February 11-13, Silver City, N. M.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electric League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m., at Jahnke's Tavern, 524 S. Spring Street.

San Francisco Electrical Development and Jovian League

President—Robert Sibley, Crossley Bldg., San Francisco.
Secretary—J. D. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.
Next meeting—February 6.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—H. L. Vorse, Box 973, Portland, Ore.
Secretary—Orrin E. Stanley, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—E. B. Hussey, Alaska Bldg., Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco

President—B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.
Meeting: January 16. George A. Posey spoke on "The Oakland Estuary Bascule Bridge."

MISCELLANEOUS**American Ass'n for the Advancement of Science—Pacific Division**

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual. Next meeting—March 28-30, 1918, Throop College of Technology, Pasadena, Cal.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Personal Items

M. J. Walsh left Portland, Ore., for an extended stay in California, and the M. J. Walsh Electric Co., the new name of the 311 Stark Street Electric Store, is under the able management of S. W. Bridges, secretary-treasurer of the company.

F. M. Nourse has joined the advertising department of the Cutler-Hammer Manufacturing Company of Milwaukee, in the capacity of technical writer. In 1915 Mr. Nourse took charge of the Portage, Wisconsin, division of the Wisconsin Power, Light & Heat Company, and later became associated with the Electrical Engineers' Equipment Company of Chicago.

William Shore Smith of Eugene, Ore., will represent in Oregon the Mountain State Power Company, capitalized at five million dollars, which has been issued a permit to operate in Oregon.

B. Badrian, formerly with the Pacific States Electric Co., and for the past year a part of the Hurley Machine Company's selling organization, representing the company on the Pacific Coast, has just finished a two weeks' visit at the company's new factory in Chicago.

Changes and Beginnings

E. G. Robinson Electric Co., formerly at Arlington, Wash., is now located at Canby, Oregon.

The Grand Electric Co., of 127 Grand avenue, Portland, Oregon, report the completion of a large power installation at the Hesse-Martin Iron Works.

The warehouse and sales office of the Western Electric Company at Seattle, Wash., has just moved into new quarters at 84 Marion street.

The Mountain State Power Company, capitalized at \$5,000,000, a corporation organized under the laws of Delaware, with principal offices at Wilmington, has been issued a permit to operate in Oregon. It will be represented by William Shore Smith of Eugene, and presumably its center of operation will be at that place. Officers and directors are all Chicago men.

Goldsborough Telephone Company, of Shelton, Wash., has applied to the county commissioners for a 25-year franchise for constructing, operating and maintaining telephone lines in certain sections of the county.

Ford, Bacon & Davis, engineers, announce the formation of the Ford, Bacon & Davis Corporation, organized for the purpose of conducting a general contracting business, with particular reference to industrial, public utility and power plants, steam and street railroads, docks, steamship and railway terminal facilities, subways, tunnels, hydro-electric and irrigation projects. Its headquarters are at 115 Broadway, New York, with offices at New Orleans and San Francisco.

The Wagner Electric Manufacturing Company, of St. Louis, announces the removal of its Seattle office to 535 First avenue, South, to continue in charge of Mr. C. Kirk Hillman.

Hughson & Merton has moved from 530 Golden Gate avenue to 77 O'Farrell street. This company now represents the following concerns: Chelton Electric Co., Clifton Manufacturing Co., Eagle Glass and Manufacturing Co., Franklin Steel Works, F. J. Meyers Manufacturing Co., H. Northwood Co., W. R. Ostrander Co., National Metal Spinning and Stamping Co., Electric Cable Co., American Vulcanized Fibre Co., Ericsson Manufacturing Co., and the Trenton Porcelain Co.

The Bay Point Electrical Supply Company has bought a lot on Main street, Bay Point, and will immediately commence the erection of an electrical shop. The building is for the offices of the Bay Point Light & Power Company, the Bay Point Building Materials Company, and the Electrical Supply Company.

At its new branch, 722 Market street, San Francisco, the Western Union has installed a typist to whom the public may dictate messages without charge. This plan originated at the Los Angeles office and will be extended to other Western Union offices.

Copies of articles of incorporation have been filed by the Beaver River Power & Light Company, of Salt Lake city. The company is formed under the laws of Delaware and will operate in Beaver county, Utah, holding meetings at Provo. The capital stock is \$400,000. Incorporators are C. L. Rimplinger of Wilmington, Del., M. M. Clancy of Wilmington, Del., and Clement M. Egner of Elkton, Md.

Prospects for New Business

The erection of a gigantic steel and pig-iron manufacturing plant on Puget Sound is vouched for by the authorities, who assert that construction will commence as soon as permission to buy necessary machinery and equipment is obtained from the General Defense Board. The reported initial units of the plant will cost \$9,000,000, and the fully completed project approximately \$25,000,000. The establishment of the plant will mark the beginning of the greatest period of industrial development the Northwest has ever known, and will presage the location of numerous industries utilizing steel as raw material.

Recently contracts for twenty steel steamships of 8800 tons capacity, to cost approximately \$40,000,000, were awarded to Portland shipbuilders by the United States Shipping Board. These are the first contracts granted the steel ship-yards in Portland.

The Whalen Pulp & Paper Company, Ltd., of Vancouver, B. C., is building up a vast industry where their hydro-electric system will develop eventually 20,000 horsepower.

The latest addition to the activities centering around Astoria's new municipal dock is the plant of the Astoria Marine Iron Works, which has entered into an agreement with the Port of Astoria to use a portion of pier 2 for the operation of a marine machine and iron working plant. A contract has been entered into between the machine plant and the Pacific Power and Light Company for 100 horsepower in motors. The electrically operated coal handling equipment at the port docks has also been placed in operation, and will be used by many steamers and government vessels, who will make Astoria a port of call on account of these facilities.

The report of the light department of the city of Tacoma, Wash., shows that during November, 1916, the average amount of power used daily was 107,000 kilowatts per hour and the average for November, 1917 was 163,000 kilowatts per hour each day.

Rate Increases

Applications for increased rates have been filed by the Gas and Electric Company of San Jose, Cal.; Winnipeg Electric Railway of Canada, and the Pacific Power & Light Co., Lewiston, Idaho.

The California Railroad Commission has decided that government railroad control will not affect the applications for rate increases which electric railways have filed. This news has strengthened electric railway securities, and, with the freight business these lines are developing, the prospects in this field are much better than they have been.

Rate-Base Valuation

The engineering department of the Washington Public Service Commission has completed valuation of the Washington Water Power Company electric system in the Inland Empire, including a part of Idaho. As fixed by the engineering department, but not yet formally passed upon by the commission, the company's property in Washington is valued at \$21,624,595, and in Idaho at \$2,491,823, or a total of \$24,116,418, not including power site valuations.

New Business for the Pacific Gas & Electric Co. of Arizona

The Pacific Gas & Electric Company of Phoenix, Ariz., has executed a contract with the Southwest Cotton Company, a subsidiary of the Goodyear Rubber Company, for 1200 k.w. of power for pumping and ginning. The Southwest Cotton Company has now contracted a total of 1800 k.w. for this purpose.

Thirty-five hundred additional acres of desert land will be developed this spring and planted in long staple cotton. The Southwest Cotton Company has invested over \$2,500,000 in Salt River Valley, Arizona, within the last year and will greatly increase this investment during the coming year.

Long staple (Egyptian) cotton of Pima variety, grown in the Salt River Valley is yielding this year between 76c and 80c a pound, and it is expected that 100,000 acres will be planted in cotton this year.

Financial

The directors of the Crocker-Wheeler Company, electrical machinery manufacturers of Ampere, N. J., have announced that the regular dividends of 1¼ per cent on the preferred and 2 per cent on the common stock would be paid for the last quarter of 1917.

The American Gas & Electric Company has declared an extra dividend of 2 per cent on the common stock and the regular quarterly dividend of 2½ per cent on the common shares, both payable January 2d to stockholders of record December 18th; also the regular quarterly dividend of 1½ per cent on the preferred stock, payable February 1st to stockholders of record January 18th.

The Portland Railway, Light & Power Company has submitted the following report:

	1917.	1916.
October gross	\$ 522,294	\$ 459,720
Net after taxes	198,966	211,313
Surplus after charges	22,102	30,033
Twelve months gross	5,895,640	5,429,252
Net after taxes	2,623,267	2,385,300
Surplus after charges	462,564	207,053

Oakland Municipal Railway

Mayor John L. Davie of Oakland recently in a message to the City Council recommended the municipal ownership of the street railway system of the east bay cities. The city council adopted the recommendation and took first steps to make effective the project of acquiring the lines. The council directed the appointment of a citizens' committee to work at once upon plans.

Railroad Commission Application

A 20 per cent raise in the price of electricity for nearly all users with the exception of "domestic consumers," was asked by the Great Western Power Company and the Pacific Gas & Electric Company, in an application filed with the California Railroad Commission. With the exception of railroads and other utilities, state and Federal departments, municipalities and domestic consumers, the two big electric companies ask authorization to raise their rates to industrial, agricultural and commercial users.

Seattle Six-Cent Fare

The Washington State Public Service Commission states that in order to enable the Puget Sound Traction, Light & Power Company to meet the situation more adequately, the company might have a hearing at once on a petition to advance the fare on street cars from 5 to 6 cents, as was done some time ago in Portland.

Zone Rates Asked

The Pacific Telephone & Telegraph Company has filed with the Public Service Commission a proposal for the establishment of a new system of long distance rates in Oregon, the proposed system to be established on the zone or block basis, similar to the systems used by the telegraph and express companies. The proposed changes will be passed upon by the commission, probably at a formal session, before any decision is made as to their acceptance.

Portland Six-Cent Fare

The Public Service Commission of Oregon has permitted the Portland Railway, Light & Power Company to increase its fares to 6 cents.

New Power Site Reserve

The Secretary of the Interior recently recommended, and the President has approved, the inclusion within a power-site reserve of about 196 acres of public land in the Big Sandy River Basin, Ore., in order that this land may be used in connection with the development of power, but not for other purposes. The withdrawal for power-site purposes of a tract within the El Dorado National Forest, Cal., has also been recommended by the Secretary of the Interior and approved by the President.

Crocker-Wheeler Bonus

To meet unusual conditions incident to the war, Dr. Schuyler S. Wheeler, President of the Crocker-Wheeler Company, electrical machinery manufacturers of Ampere, N. J., recently announced a bonus under which its employes will receive not less than 10 per cent of their wages since October 1, 1917, and during the coming year. All employes receiving less than \$2500 yearly will benefit and those who have been in the employ of the company for more than a year will receive 12 per cent of their earnings.

Abandonment of Unprofitable Line

The Utah Public Utilities Commission holds in a case affecting the Emigration Canyon Railroad Company that a railroad company makes out a case for the abandonment of its road where it is shown that the purpose for which it was built has ceased to exist, that the road is operated at a loss, that there is no prospect for any change in the situation, and where it appears that there is no question as to connection with other railroads or any charter or other obligations to estop it. The mere fact that numerous persons have purchased land and made improvements thereon in the belief that a railroad will be operated is not, as a matter of law, a sufficient reason to require its continuance.

BOOKS AND BULLETINS**Testing Current Transformers**

A new publication of the Bureau of Standards (Scientific Paper No. 309), entitled "A Method for Testing Current Transformers," was issued November 3, 1917. A general method is outlined in this paper for the determination of the ratio and phase angle of current transformers in terms of the constants of previously calibrated standard transformers of the same nominal ratio. It has been shown that such methods are essentially more sensitive, or conversely, may be used with much less sensitive instruments, than the laboratory methods now in use for the absolute determination of the ratio and phase angle of a single transformer. Two of the most convenient of the many possible modifications of the general method are described in detail. It is hoped that the methods will be found useful in commercial plants where delicate laboratory equipment is not available, and where large numbers of transformers must be tested rapidly and with moderate accuracy.

Central Stations

by Terrell Croft, Consulting Electrical Engineer; size 8x5½; 330 pp.; published by McGraw-Hill Book Company, Inc., New York City, and for sale by the Technical Book Shop, San Francisco. Price, \$2.50.

Mr. Croft has presented his subject so simply that it can be readily studied by the reader of modest mathematical attainments. The different factors which are utilized frequently in central station practice are discussed exhaustively. Following the treatment of fundamentals, the elements of transmission and distribution are examined. Final chapters in the book concern electrical-energy generating stations and their equipment. In connection with the text numerous illustrations are given showing modern central-station practice.

LATEST IN EVERYTHING ELECTRICAL

(With the present extensive use of high-head Francis turbines, it is interesting to note that 1906 marked the installation of the first of this type for operating heads over 400 feet. The history of this development and the present standing of the various types of turbines for high-pressure service, is interestingly described in the following article. The author is consulting engineer in the hydraulic department with the Allis-Chalmers Manufacturing Company.—The Editor.)

HIGH-HEAD FRANCIS TURBINES AND THEIR OPERATING RECORDS

BY ARNOLD PFAU

The application of the Francis turbine in its early stage of development was rather limited to a narrow range of head, due to a number of circumstances.

The early design of the Francis turbine followed the principal characteristics of its forerunner, the Jonval-Turbine (axial-discharge, reaction-turbine). This may account for the limitations in the application to extremely low heads and to high heads.

The character of the commercial development also greatly influenced the progress made, inasmuch as all energies were concentrated towards the production of stock articles, with a view of quickly conquering the new and vast market, rather than towards a real perfection and development purely from an engineering point of view.

Finally, the fact should not be overlooked that the early Francis turbine appeared at a time when electrical transmission of energy was practically unknown. The use of turbines was, therefore, limited to direct mechanical transmission by gears, belts, ropes, etc., all of which did not permit of high speeds or of large capacities.

With the development of electrical transmission of energy an enormous field of application of water power was at once opened up. The ever increasing demands in regard to speed and capacity of turbines suitable for direct connection

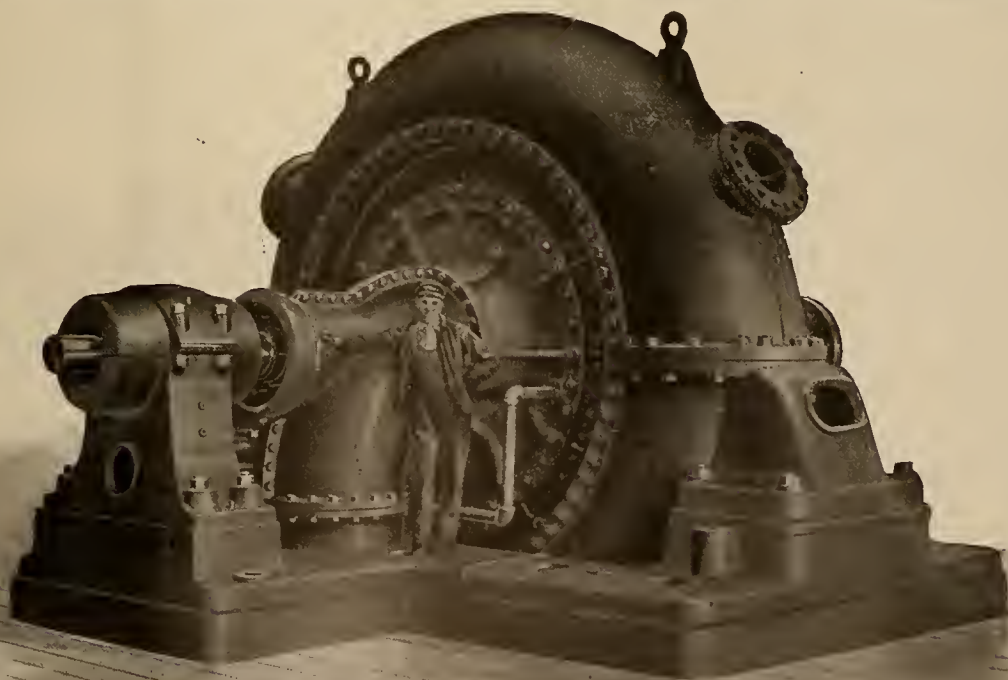
with generators, and the greater possibilities for commercial development of water power with heads heretofore outside of the practical range, made it imperative to develop the hydraulic prime movers to such an extent that they now cover the entire range of head found within the limits of nature.

The intense studies made have brought about an almost entire elimination of the numerous designs previously used, and today we find only two principal types applied—the Francis type, or reaction turbine, and the impulse type, or action turbine.

The Francis turbine is adapted for low and medium heads exclusively and for moderately high heads when large capacities are involved.

The impulse wheel is limited to very high heads exclusively and moderately high heads when moderate capacities are involved. From the above it follows that there is a so-called twilight-zone of application of both types.

For a fixed head and a required capacity, the quantity of discharge of a hydraulic prime mover becomes fixed. This in turn limits the total area of the passageways of the runner of a Francis turbine (or the throat area of the nozzle of an impulse wheel). The speed of the prime mover fixes the diameter of the runner, which in turn also affects the passage area of the Francis runner, or the ratio of wheel diameter to jet diameter of an impulse wheel. Consequently the individual passage areas of a Francis runner decrease as the head increases and the ratio of the wheel diameter to jet area

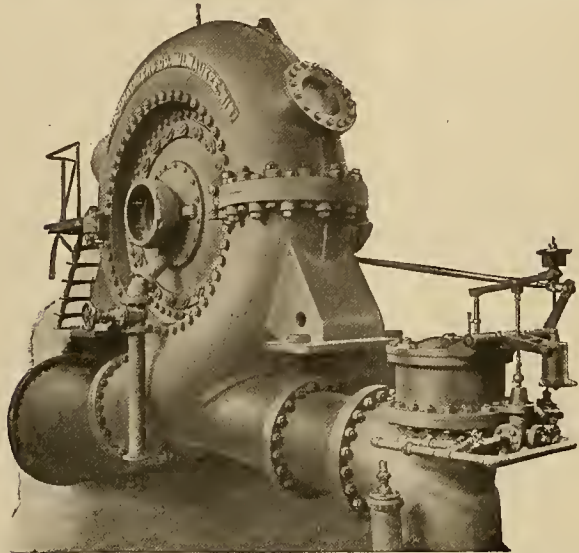


AN IDAHO INSTALLATION

Double discharge Francis turbine, 440 ft. head, 8500 horsepower, 300 revolutions per minute. Two built in 1907 for Telluride Power Company, Bear River Plant, Idaho

of an impulse wheel decreases as the head increases, and also as the capacity increases. We thus approach conditions where the design of a Francis turbine becomes impractical because of uncommercially high speed of the generator for a given capacity, or because of too great capacity for commercial speed.

Similarly, conditions will be found where the design of an impulse wheel (even with a multiple arrangement of jets) becomes impractical, because of uncommercially low speed



Single discharge overhung Francis turbine, 450 ft. head, 7000 horsepower, 450 revolutions per minute. Three built in 1911, for Northern California Power Company, Coleman Plant, California.

for a given capacity, or because of too small capacity for a commercial speed.

"From the above it follows that the practical limits of application of an impulse wheel in the direction of the lower heads is pretty well fixed, whereas the limits of application of the Francis turbine in the direction of the higher heads to some extent permits of greater and greater development as the required capacity of the unit is increased, and as the load conditions of such a generating unit permit of operation at a continuously fair gate-opening, or load factor."

Aside from the question of correct design of a high-head Francis turbine runner, from the point of view of hydraulic wear and tear, the problem of properly taking care of the end thrust was one which greatly impeded the application of the single discharge type of turbine. To avoid the dangerous end thrust the double discharge type was employed and is still being used. The runner divides the operating water into two quantities, discharging each separately through a quarter turn and draft tube. While this type eliminates to some extent the end thrust, it has several decidedly undesirable features. The wetted area is greatly increased, which in turn increases friction losses. The runner must be placed at the point of greatest deflection of the shaft, thus making it necessary to have a large diameter of the latter, which in turn offers an excessive obstruction to the flow of water.

With the introduction of the single discharge turbine, and particularly with the overhung type, the runner can be placed close to one of the main generator bearings and no shaft of appreciable dimensions, if any, is required in the quarter turn side. The much feared end thrust can be taken care of absolutely reliably by a hydraulic balancing device formed by the side walls of the runner and the adjacent walls of the cover plates. By properly designing these balancing chambers the runner is forced to rotate with a negligibly small end motion, so that it could be operated without any mechanical thrust bearing, were it not for the first periods of starting and the last periods of stopping of the turbine,

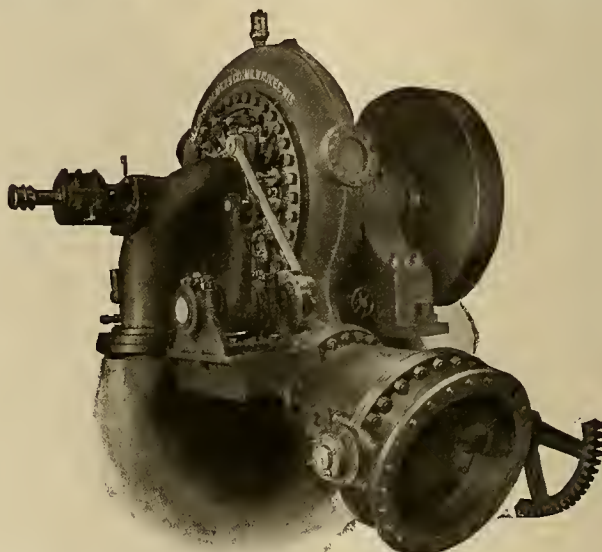
Successful Francis turbines for operating heads exceeding 400 feet were an unknown quantity prior to 1906. A few attempts to install this type were made at an earlier date, the results, however, were such that it seems to be advisable to eliminate same from the records.

It affords the writer particular pride to state here, that it was a California engineer, Mr. F. G. Baum, whose efforts and farsightedness made it possible to secure the contract for the then most powerful single discharge Francis turbine for operation under a net head of 550 feet, and that it was a California power corporation which had the confidence in their engineer's judgment and the manufacturer's ability to furnish a turbine which would prove a success even for requirements so vastly more severe than anything previously attempted.

The results obtained with this turbine are a monument to all who took an active part in the work, results, which have proved to be the milestone on the road to the successful development of the modern high-head Francis turbine.

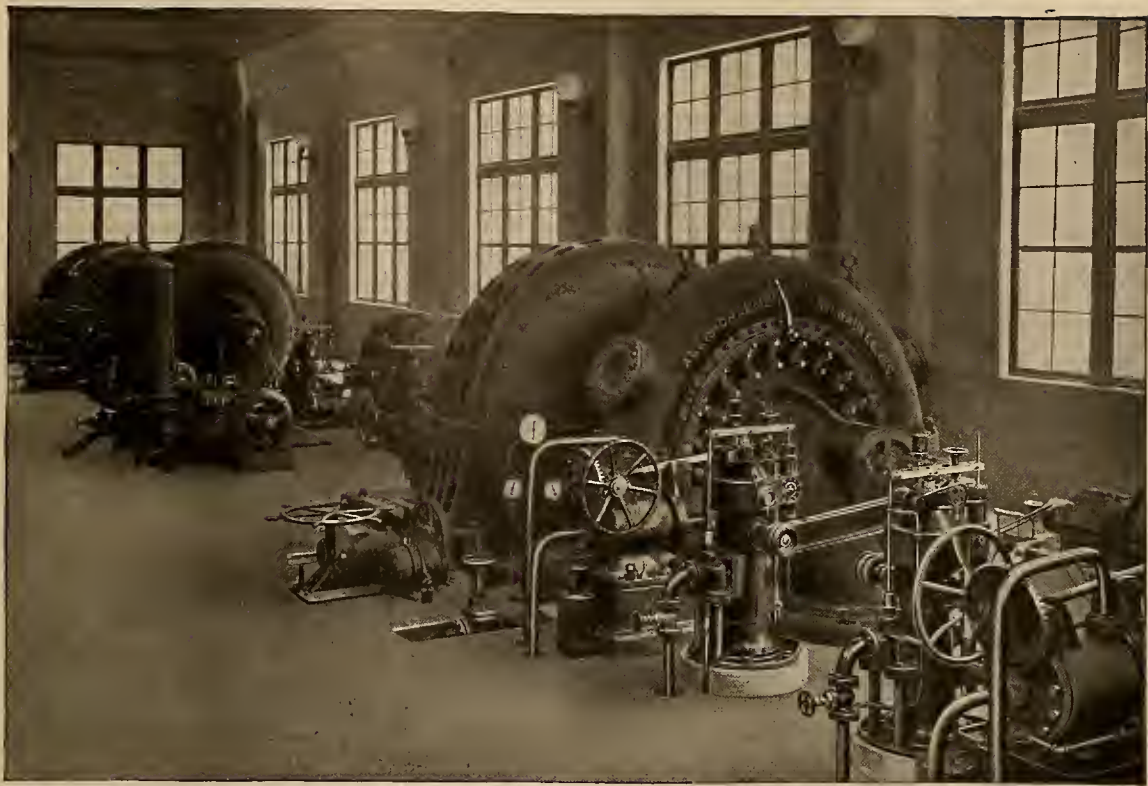
In summer of 1907, this unit was placed in commercial operation at the Centerville plant of the Pacific Gas & Electric Company, and it has since delivered power almost uninterruptedly. In spite of the fact that the speed of 400 R. P. M. was fixed by the purchase of the generator in advance of that of the turbine, being first intended for operation in connection with a multiple jet impulse wheel, so that the speed was lower than desirable, for obtaining best results with a Francis turbine, nevertheless the hydraulic wear and tear proved to be exceedingly small. During about seven years of operation, the runner, guide vanes, and other parts in contact with the water flowing at high velocity, required no replacement, and the wearing qualities of these parts proved to be at least equal to what it would have been possible with the corresponding parts of an impulse wheel. The efficiency of the unit remained practically constant, and, exceeding 86 per cent at all periods, was higher than could have ever been obtained with an impulse design, especially one embodying a multiple jet arrangement.

With the exception of an improvement in the design of the hydraulic balancing device as a natural result of the progress of the art, this unit is today the same as originally designed. Its splendid operating record has proved beyond a doubt that the correct application of a Francis turbine for



Single discharge Francis turbine, 550 ft. head, 4000 horsepower, 720 revolutions per minute. Two built in 1911, for Cleveland Cliffs Iron Company, Carp River Plant, Michigan.

high heads is well justified and that it offers manifold advantages over that of an impulse wheel under identical operating conditions.



CITY PLANT, TACOMA, WASH.

Single discharge overhung Francis turbine, 450 ft. head, 8000 horsepower, 450 revolutions per minute. Four built in 1911, for city of Tacoma, Nisqually Plant, Washington.

When a novel design is in the progress of its making it is sometimes possible for the experienced designers to form a reliable idea whether it is going to be a success or a failure. The success of this new turbine was so distinctly projected on the vision of the engineers that it was felt unnecessary to await actual results in operation, and it was decided to vigorously conquer the new territory opened.

During the period of construction of the Centerville turbine, two 8500 hp. turbines for 440 feet net head were built for a speed of only 300 revolutions per minute. Here also the generator contract was let in advance of that of the Francis turbine, which required a special design of runner, owing to the relatively low speed. The speed had been selected to suit the hydraulic characteristics of the so-called Victor turbine and action-type of turbine. Sad experience with this turbine has since resulted in its entire expulsion from practical application. The troubles encountered with the thrust bearings of that type of turbine were so deep rooted in the minds of the engineers that they insisted upon a double discharge design in order to avoid excessive thrust. Introducing the double discharge feature at this low speed greatly increased the danger of pitting the runner, guide vanes and removable liners of the guide case walls. Notwithstanding the very unfavorable conditions, these units have given entirely satisfactory service, a replacement of the wearing parts having been made only once during the ten years of operation. The success evidenced by the performance of these pioneer turbines was the beginning of an extensive development of high-head Francis units. The victory of the Francis turbine over that of the action type of turbine was so complete that not only did it stop a further application of the same, but even led to a number of replacements of action-turbines, and even impulse wheels, by low-speed Francis turbines.

Among the many replacements we may cite the Olmstead plant of the Telluride Power Company at Provo, Utah. Here, three action-turbines were replaced by overhung single discharge Francis turbines, each of 3600 hp. under 330 feet

head at 300 revolutions. The runner was placed directly upon the end of the existing generator shaft and the whole reconstruction of the hydraulic end of the plant was accomplished without even removing a single part of the generator.

Through the efforts, in 1908, of the late Mr. W. R. Eckart, consulting engineer of San Francisco, the third unit for the Potter Valley Plant of the Snow Mountain Water & Power Company, a 4000 hp. Francis turbine for 450 feet head and 450 R. P. M., was made of the single overhung type. Its excellent records, only one replacement of the renewable parts, was the leading factor in the award of the contract of the fourth unit, which is practically a duplicate of the previous order.

Where it was possible to select the type, speed and capacity so as to best suit the operating head, the wear and tear proved to be a minimum. As an example, we may cite a few such plants:

- Coleman Plant, California, of Northern California Power Company. Three 7000 hp. units 450 R. P. M., 450 feet head, operating since 1911; no replacements.
- Prospect Plant, Oregon, of Rogue River Electric Company (now California-Oregon Power Company). One 6300 hp. unit, 514 R. P. M., 487 feet head; operating since 1911; no replacements.
- Carp River Plant, Michigan, of Cleveland Cliffs Iron Company. Two 4000 hp. units, 720 R. P. M., 550 feet head; operating since 1911; no replacements.
- Nisqually Plant, Washington, owned by City of Tacoma. Four 8000 hp. 450 R. P. M., 410 feet head; operating since 1911; no replacements.

One of the most recent repeat orders establishes a new world's record for size of unit of the type in question. It is a 25,000 hp., single, spiral-casing Francis turbine operating under 440 feet net head at 360 revolutions per minute. It is the largest horizontal shaft unit in existence and regardless of type, it is exceeded only in power by the three 31,000 hp. vertical shaft units which were furnished by the same manufacturer and which have been in commercial operation for five months at the Narrows Plant of the Tallassee Power Company, at Badin, N. C.

NEW ELECTRICAL DEVELOPMENTS

(The past two weeks have marked increasing activity in the Pacific Northwest. The government has reversed its decision in regard to the Skagit River power project, and the city of Seattle has authorized the issuing of utility bonds for five million dollars. The Alaska Gastineau Mining Company has planned a twenty-five million dollar mill which will call for a large new power load. In the Southwest the control of the Colorado River is receiving attention in Los Angeles, as well as in the border agricultural districts.—The Editor.)

THE PACIFIC NORTHWEST

PORT MOODY, B. C.—The Aetna Steel Works here will install a six-ton electric smelter furnace.

COLFAX, WASH.—The city council recently granted the Pacific Telephone & Telegraph Company a ten-year franchise to operate in the city.

NELSON, B. C.—Application has been made to the council of the Kootenay General Hospital for the installation of an electric lighting system to cost about \$1,180.

VANCOUVER, B. C.—An electric lighting plant, it is understood, will be installed at the ship-building yards of J. J. Coughlan & Sons; also 12 electrically operated cranes.

EVERETT, WASH.—Norway-Pacific Construction & Dry Dock Company, of Seattle, will construct a \$1,000,000 shipyard and drydock in Everett. M. G. Thomle, president, Seattle.

TACOMA, WASH.—City officials are planning an additional storage system for the municipal power plant at La Grande that will increase the horsepower of the present plant 17,500.

TACOMA, WASH.—Plans are being considered for placing the electric wires of the municipal electric light department under ground, for which estimates of cost are being prepared.

EUGENE, ORE.—N. C. Nelson, engineer for the Eugene, Ore., water board, reported that it will be possible to develop 5000 theoretical or 3600 actual horsepower for the use of the power plant at Walterville.

VANCOUVER, B. C. — Amendments to city by-laws adopted by the Vancouver city council recently provide that jitney competition against the B. C. E. R. Company will be prohibited after April 1, 1918.

CHEHALIS, WASH.—O. E. Anderson of Portland has presented a franchise to the city for an electric light and power business here that will come into competition with the North Coast Power Company.

SEATTLE, WASH.—The Electric Manufacturers' Agency of Seattle, has filed articles of incorporation with a capital stock of \$20,000. The incorporators are Joseph Schoemer, George Buckman and W. Funfsinn.

SEATTLE, WASH.—The Seattle Mechanical & Electro Plating Company, of Seattle, has filed articles of incorporation with a capital stock of \$2,500. Filed by Longfellow & Fitzpatrick, 1001 Smith Building, Seattle.

PRINCE RUPERT, B. C.—The Prince Rupert Hydro-Electric Company has offered the city the Falls River power site, including improvements on it, for \$34,000 in municipal bonds and the offer is being given consideration.

VICTORIA, B. C.—Changes amounting to \$25,000 have been planned by the Canadian Refrigerating Plant. The capacity of the plant will be increased and it will be equipped for electrical operation. Special motors and machinery will be installed.

WALLA WALLA, WASH.—The Lower Mud Creek Telephone Company has petitioned the Walla Walla county commissioners for a 50-year franchise to construct, maintain and operate a telephone and telegraph line over certain roads in the county.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has started work on the building of the superstructure of its coal pulverizing plant adjoining the

power site on Western avenue and Seneca street, which will cost \$75,000.

SEATTLE, WASH.—Plans are being prepared for the construction of a sub-station for the city lighting department at West Forty-ninth street and Fourteenth avenue, N. W., one and two stories high, 66x66 feet. The estimated cost is \$7,000. Daniel Huntington, city architect.

TRAIL, B. C.—The West Kootenay Power & Light Company contemplates extending its electric transmission line to the property of the Canada Copper Company at Princeton to furnish electricity to operate the proposed 3000-ton concentrator which the company is planning to build.

SEATTLE, WASH. — Construction of a steam power plant on the water front with sufficient capacity to furnish 12,500 kilowatts of electric power and steam sufficient to heat the buildings in the district between Madison and Main streets and Third avenue and Elliott Bay, would cost \$600,000, according to Superintendent of Lighting J. D. Ross.

VANCOUVER, WASH. — A great lumber cut-up plant providing raw material for aeroplanes will be erected and operated by soldiers. The new plant will be 350 by 400 feet in size, and will be equipped with electrically operated machinery capable of working up 300,000 feet daily. The cost is estimated at \$200,000, and February 15th is the probable date of completion.

SEATTLE, WASH.—An electrically operated steel plant will be erected on Puget Sound, near here, as a result of the choice made by the Alaska Gastineau Mining Company in choosing a site for its recently formed company. The enterprise is said to involve the sum of \$25,000,000, of which \$9,000,000 will be spent on the plant's first unit. Work is expected to begin shortly. The concern is composed of a number of San Francisco financiers, among whom are B. L. Thane, S. F. B. Morse, W. H. Crocker and others.

SEATTLE, WASH.—The city has been granted a permit by the government to develop the Skagit river power project in the national reserve. For this utility bonds in the sum of \$5,000,000 have been authorized. Bids for constructing such a plant will be received by the Board of Public Works up to 10:00 o'clock a. m., March 1, 1918. The city is also given priority right to the remainder of the river, this temporary permit to remain in force up to May 15, by which time the city shall place in the hands of the Federal department its plans for the ultimate development of the upper and greater site. Specifications are ready for the bidders. Twenty-five thousand kilowatts will be developed by this first unit, or about 33,000 horsepower.

THE PACIFIC CENTRAL DISTRICT

STOCKTON, CAL. — Construction work is progressing steadily on the \$1,250,000 plant of the National Paper Products Company just west of Stockton. About 600 people—all skilled labor—will be employed.

BROOKDALE, CAL.—The Mountain Light & Water Company of Brookdale has petitioned the State Railroad Commission for permission to discard its flat rates and install meters in the residences of its patrons.

FRESNO, CAL.—The contract for the construction of an electrolier system from G and Fresno streets to the city

limits on Kearney avenue was awarded to the Lewis Electrical Company of Fresno. The bid was \$18,300.

ROUND VALLEY, CAL.—The application of the Interstate Telegraph Company for permission to collect from Round Valley telephone patrons according to the company's schedule of rates, has been granted by the State Railroad Commission.

LA GRANGE, CAL.—The Railroad Commission has authorized the Sierra & San Francisco Power Company to use \$13,670 from the sale of its \$1,000,000 bond issue for additions and improvements to the La Grange division of the Yosemite Power Company, recently purchased by the company.

SAN FRANCISCO, CAL.—Receiver John P. Coghlan of the Northern Electric Railway Company sought an order from United States District Judge Dooling, authorizing the purchase of an additional electric motor of sixty tons at a price of \$37,500.

CHICO, CAL.—The city council is considering a proposal submitted by the Northern California Power Company for lighting the streets of the city for a period of four years. The company agrees to furnish electricity to maintain the entire system at \$275 per month. The contract provides for larger lamps in the residence districts.

BISHOP, CAL.—The Nevada-California Power Company is contemplating the construction of a high-voltage line to Ely, Nevada, calling for increased power facilities on Bishop Creek, and involving the expenditure of approximately \$300,000 for the construction of a pole line.

OAKLAND, CAL.—The Kings Electric Company, Oakland Bank of Savings Building, has been awarded contract for electrical work in public library building at Fifty-sixth street and San Pablo avenue, at \$1,955; also for public library building at Fifty-second street and Telegraph avenue, at \$1,955.

WOODLAND, CAL.—Electricity for Guida, Rumsey, Brooks and environs will be supplied by the Pacific Gas & Electric Company within a few weeks. The local men will go to Dixon to determine what connection would have to be made to furnish the western Yolo towns with electricity. Guida and the other nearby stations all come in the Solano district.

REDWOOD CITY, CAL.—Bids will be received up to February 4th for installing and maintaining on the Lomita Park Highway Lighting District thirty-one 40-watt tungsten lamps to burn 3000 hours per year, under a five-year contract; also for installing and maintaining on the Belmont Highway Lighting District thirty-nine 60-candlepower and eight 100-candlepower tungsten lamps under a five-year contract.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—B. B. Bell Company has incorporated with a capital stock of \$30,000 to manufacture lighting fixtures, etc.

RIVERSIDE, CAL.—The National Ice Company, it is understood, is contemplating using electricity instead of water power to operate its plant.

LOS ANGELES, CAL.—Specifications for installing and maintaining a lighting system in the Athens Lighting District have been adopted, and bids called for.

SILVER CITY, N. M.—The large Diesel engine in the plant of the Silver City Power Company was recently damaged by an explosion, causing a loss of about \$10,000.

KINGMAN, ARIZ.—The Mormon Church has been asked to appropriate \$25,000 for the building of a storage dam on the Virgin River, Arizona, to generate power for the operation of a flouring mill and cotton gin.

CORONA, CAL.—The Southern Sierras Power Company, which operates in Inyo, Kern, San Bernardino and Riverside counties, is planning to take over the property and holdings of the Corona Gas & Electric Light Company, which operates in Riverside county.

SANTA MONICA, CAL.—Sealed bids will be received by the city council for the construction of an ornamental lighting

system, consisting of ornamental reinforced concrete lighting posts with wires, pipes, conduits, lamps, etc., on both sides of Colorado avenue.

LOS ANGELES, CAL.—The board of supervisors has adopted an ordinance granting the Pacific Electric Railway Company a franchise to construct and operate an electric railway on certain highways and public roads in Los Angeles county for a period of 40 years.

SAN BERNARDINO, CAL.—Extensive improvements are contemplated by the Atchison, Topeka & Santa Fe Railroad Company at its local works, which include the construction of a new blacksmith shop, an electric power plant and sub-way. The cost is estimated at \$240,000.

CARLSBAD, N. M.—The Carlsbad Light & Power Company has been incorporated with a capital stock of \$150,000 to construct and operate an electric light plant in Carlsbad. The corporation is contemplating the installation of a steam auxiliary plant and proposes to use oil for fuel.

RIVERSIDE, CAL.—The Board of Public Utilities Commission has decided to offer for sale to the Southern California Edison Company all the city pole line north of the city limits, provided it will move the point of delivery from Palm and Mount Vernon avenues in San Bernardino county to the Riverside city limits on La Cadena drive.

EL CENTRO, CAL.—The Los Angeles Chamber of Commerce has taken the initiative in a definite movement to provide for the control of waters of the Colorado River. The estimated cost of seven storage basins is \$50,000,000. It would be possible to irrigate four to five million acres of rich land. The cost of hydro-electric plants is not included in this \$50,000,000 estimate.

LOS ANGELES, CAL.—Mayor Woodman has outlined a plan whereby it may be possible to provide funds to complete the city's power plant No. 2, thus opening the way for the early generation of 25,000 additional horsepower. The mayor said the sinking fund could be utilized to buy a hock of the \$1,020,000 Hollywood water bonds, thus releasing a large amount of public service commission funds to start the work.

INTER-MOUNTAIN DISTRICT

LIVINGSTON, MONT.—A new ornamental lighting system has been installed here.

RUPERT, IDAHO —The Eastside Electrical Company has been organized to supply the community with electricity.

SANDPOINT, IDAHO—The city is considering the purchase of the Sandpoint Water and Light Company for \$150,000.

SALT LAKE CITY, UTAH—A permit has been granted the Latter Day Saints Church to erect a power plant, to cost about \$30,000.

CARSON CITY, NEV.—The board of city trustees is considering extending the street lighting system throughout the city. The Truckee River General Electric Company of Reno furnishes electrical service in Carson City.

PAUL, IDAHO —The foundation of the substation has been built and most of the superstructure erected. One of the wasteways to be built on the pumping unit has been completed and the contract for building the remaining four has been awarded.

BOZEMAN, MONT.—The lighting plant here will be rebuilt. It is proposed to erect a new building, in front of which the fire hall would be placed, and connect the two, using the heat from the plant to keep the fire apparatus in shape for instant use.

SALT LAKE CITY, UTAH—Frank W. Ferris of Gold Hill is installing a power plant on Trout Creek at a point about 46 miles from Gold Hill, for the purpose of generating electric current for use at mines in the Gold Hill, Clifton, Willow Springs, Fish Springs, Ferber and other mining districts. The plant will cost about \$50,000, while the transmission lines will call for an additional investment of capital.

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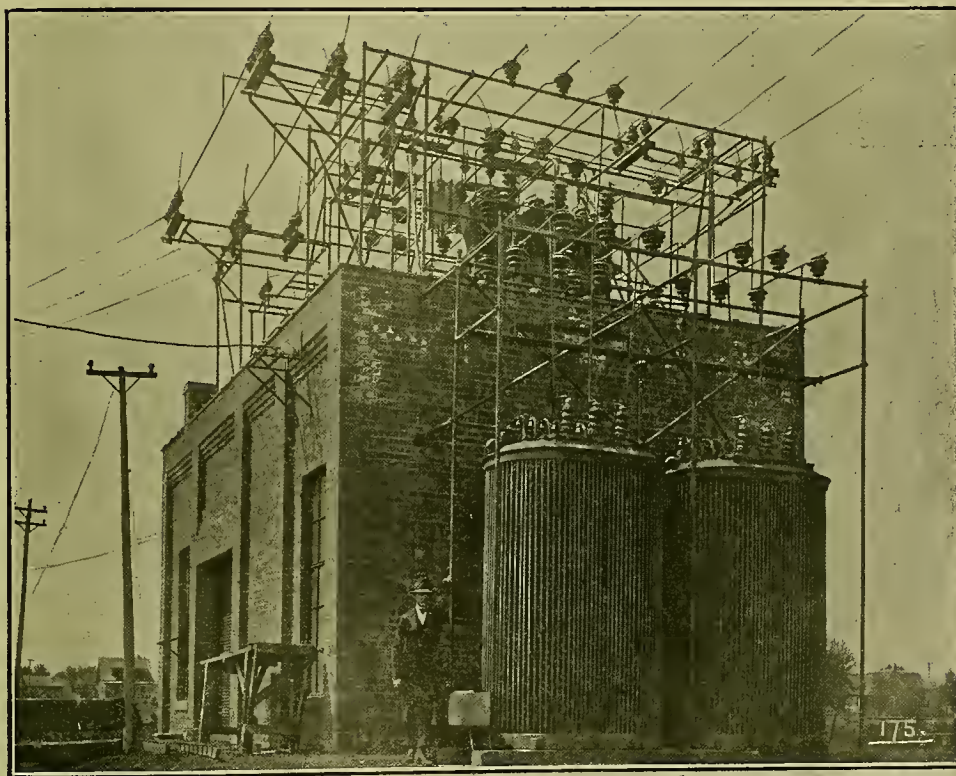
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VOL. 40 NO. 4

SAN FRANCISCO, FEBRUARY 15, 1918

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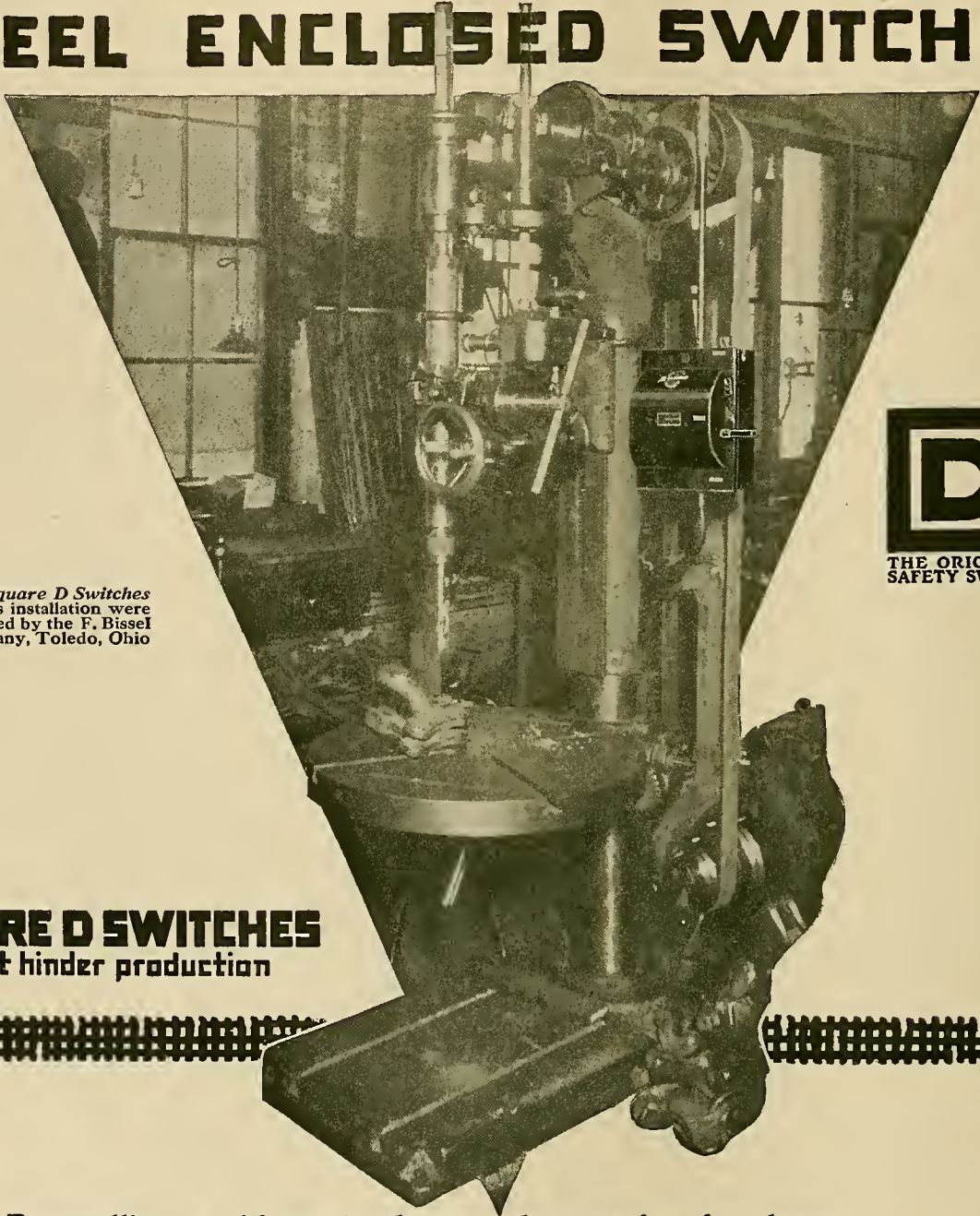
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VOLUME 40

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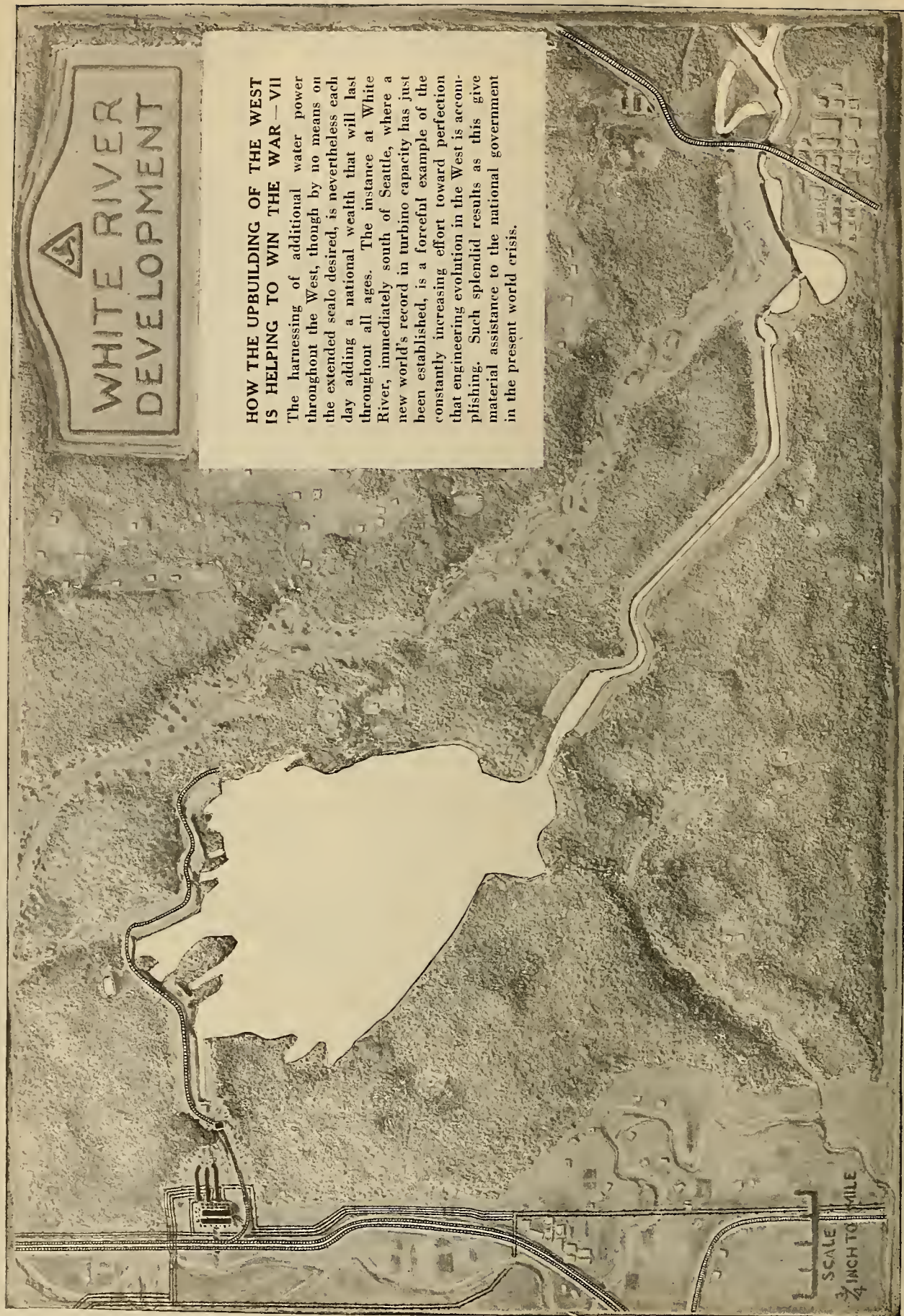
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WHITE RIVER DEVELOPMENT

HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—VII

The harnessing of additional water power throughout the West, though by no means on the extended scale desired, is nevertheless each day adding a national wealth that will last throughout all ages. The instance at White River, immediately south of Seattle, where a new world's record in turbino capacity has just been established, is a foretold example of the constantly increasing effort toward perfection that engineering evolution in the West is accomplishing. Such splendid results as this give material assistance to the national government in the present world crisis.





JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, FEBRUARY 15, 1918

Number 4

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WHICH ONE OF THESE TYPES ARE YOU?



1

In times of public danger, when those at the head of the government must of necessity be given unprecedented power, I believe that even men of tried faithfulness and men of lofty ideals have their sense of perception blurred and their erstwhile consecration to public service besmirched with an overpowering desire to forward private or partisan interest. I question their motives, I question their ability to analyze and meet the emergencies of the war. I have lost faith in my fellow man.

2

In a time when the very soul of man is under the trial of fire, and a nation founded upon principles of liberty and justice for all is being shaken to its innermost, I believe in my fellow citizens. Especially do I confidently put my trust in those in authority, believing that as a whole they are neither knaves nor fools, but to the best of their ability are endeavoring to bring to a successful conclusion the weighty problems entrusted to them for solution.

A remarkable convention is in the making for the Pacific Coast Section, N. E. L. A., at Del Monte, April 24-27, 1918.

A War Service Convention

It has been decided to combine three conventions into one big, pulsating, expressive body which shall meet to discuss problems of war emergency that have developed in the electrical industry of the West. The jobbers, the electrical contractors and dealers, and the central station men, meeting in earnest sessions bent upon making the Del Monte gathering the one big effective effort of the year, are bound to bring about results that will be lasting and most helpful in these critical times.

The entire Thursday session of the convention is to be given over to a discussion of engineering problems that have arisen to meet the emergencies of the hour—the shortage of fuel, the lack of efficient labor, the growing scarcity of hydro-electric energy, and the new problems due to interconnection on a vast and hitherto unattempted scale of operation.

On the other hand, the commercial section has problems to present for discussion that are difficult of solution and of great timely value in the field of merchandising. As a consequence, the entire Friday sessions will be devoted to the commercial section discussions, so that all attending the convention may have an opportunity to participate.

These war emergency problems are not only of great timely interest to California and other states represented in the Pacific Coast Section, but considerable interest is being shown by prominent men in the Northwest Electric Light and Power Association, and as a consequence, a goodly representation from those states is anticipated at the Del Monte gathering.

The conserving of effort by converting three conventions into one is a great saving of time and effort in these strenuous days. The emphasis made upon the discussion of war emergency problems assures a strong and representative gathering from all quarters.

Never before in the history of the industry did a time exist when greater need was felt for a getting together and a discussion of matters of common concern. And from every visible appearance the record-breaking attendance at this convention, and the consequent discussion of war emergency problems, will bear out this fact.

The fuel shortage is one of the outstanding problems of the war. Of course, in great measure, it is a temporary affair to be eased off with spring weather and a greater facility in transportation, but abnormal demands, together with the

Fuel Substitutes

working out of the economic factors of war regulation, are bound to mean high prices and minor shortages, at least through the duration of the war. The reaction to this condition naturally will be the substitution of other fuels for coal and oil wherever possible, and the working out of more efficient methods of combustion. The articles on powdered coal and bagasse as a source of fuel, appearing elsewhere in this issue, are interesting records of experiments already carried out in response to these two tendencies. The Pacific Northwest is finding it possible to use low grade coals in powdered form for factories and power plants. The utilization of the waste products of sugar refining has long been practiced, as have most of our other economies of the scrap heap, but never so intensively nor to

such good purpose as today under the spur of war necessity.

Such experiments are wholly in the interest of progress. As with so many of our war-time changes, much of the construction is permanent and easily adapted to peace conditions. The war has merely intensified and hastened a need which we would have had to meet eventually.

As a comparatively young country, the United States has up to now been a wasteful spender. The continent was so large and the country undergoing such rapid growth that it was more important to do things on a large scale than to do them efficiently. In consequence we have used lavishly and wasted gloriously. The time was coming, however, even before the war, when we could no longer claim the indulgence of youth for our folly. We must utilize our scrap heap and re-work our dump piles. Whatever the war calls forth in more efficient methods of fuel using and in the farther utilization of material hitherto wasted, is a permanent gain. The time is, unfortunately, not so far off when our coal and oil supplies will be exhausted and some other source of power must fill the need. Of course the fuel shortage in this sense is not an immediate problem, but it is always the age before the new era which prepares for its establishment. The discovery of new fuels and methods for the better adaptation of the ones we have is not only a war service, but it is one of the problems whose solution is a duty this age owes to progress.

But this problem of saving the fuel supply has even a deeper significance to the West. Blessed with giant possibilities in water power development, it is at once seen that the real salvation of the fuel situation is to develop and extend at once this great natural resource to its fullest measure of efficiency.

In 1915 and 1916 the failure of insulators on some long distance transmission lines resulted so disastrously in the way of interruptions that it was evident something had to be done unless the present generation were content to relegate long distance service to the category of intermittent or second class power. Yet the committee on transmission and distribution of the American Institute of Electrical Engineers during 1917 practically threw up its hands in despair in reporting progress on actual results accomplished.

On the Pacific Coast at the present time considerable attention is being paid to this problem, which is so closely connected with the success or failure of hydro-electric development in the West.

On another page of this issue will be found an excellent article on the present status of insulator depreciation by C. E. Oakes, a technical specialist with the United States Bureau of Standards at Washington. The author shows a wonderful grasp of the subject at hand, and this thoroughness speaks well for the efficient service that is being rendered the West by the Bureau of Standards.

The insulator problem is now also receiving the special attention of the engineering section of the Pacific Coast Section, N. E. L. A. A considerable ap-

propriation of money has been made to assist in research work that has been undertaken at Leland Stanford University under the direction of Professor Harris J. Ryan, who in the past has rendered such valuable assistance to the electrical industry along research lines. The particular investigation covers a series of tests of the effects of accelerated cyclic changes in temperature on suspension elements of various design, both with and without hardware.

Thus far it has developed that recent improvements in the manufacture of porcelain appear to have eliminated porosity as the cause of insulator failures. The trouble experienced with porcelain of recent manufacture appears to be due to strains set up by thermal expansion and contraction that cause minute cracks, into which moisture subsequently penetrates, resulting in failure.

The conclusions, however, are only tentative, and it is hoped that exhaustive tests may be put through so as to advance the insulator problem to a more secure basis.

At the laboratories of the Bureau of Standards some helpful experiments are under way. As brought out by the writer in the article appearing in this issue, according to the generally accepted theory that hardened cement is a substance of gelatinous nature, each particle of cement on reacting with water swells and becomes a gelatinous mass cementing the particles of sand together. On this theory the finer the particles of cement, the more completely will they be hydrated. These interesting experiments that are being conducted by the Bureau of Standards are being undertaken to see what results may be expected from the use of very fine particles of cement. While thus far the experiments are not conclusive, the results evidently point to ultimate good resulting from the investigation, and it is hoped may lead to the development of a cement elastic enough to accommodate all changes in length due to temperature.

The entire insulator problem is one that needs the co-operative assistance from all sections of the nation, for from the operating data of present hydro-electric systems could be ascertained the relative amount and cause of depreciation of insulators in storage, the effect of the season of the year on the number of failures, the relative failures ascribable to the use of cement, the average number of failures for the various disk positions, and the effectiveness of arcing horns and ground wires.

It is to be hoped that the current year will see much of this co-operative helpfulness brought to a concrete reality on the part of the various hydro-electric companies of the nation, and that the excellent research facilities of the various universities and the Bureau of Standards will be taken advantage of to the limit.

During the past semi-monthly period an unusual gathering has taken place at one of the League meetings in the West—that of the Electrical Development League in San Francisco. The occasion was the entertainment of a number of noted civil engineers as honored guests. In response

The High Tension Insulator Problem

The Engineer and the Salesman

to a call from the chairman of the meeting for a word on co-operation between civil engineers and electrical men, H. J. Brunner, acting president of the San Francisco Association of the American Society of Civil Engineers, brought out the fact that the engineer can learn much from the salesman.

This fact may indeed well be emphasized. Too often in the past has the engineer stood aloof and at times been so unapproachable as to make it appear that he had nothing in common with the technical man endeavoring to sell to him certain electrical ware.

In recent trying months when shortage in deliveries has been observed on all sides, the tables have been reversed and often the commercial salesman has had an opportunity to repay courtesies or discourtesies shown him in months past.

The whole matter, viewed in its broadest aspects, is subject to careful consideration. The engineer on the one hand, responsible to his client as a technical adviser, has certain definite duties to perform, while the salesman on the other hand, keen and alert to varying conditions of the trade and new advances in the art, has much to offer that is well worth the attention of the engineer.

To keep abreast of the times this personal contact of the engineer with the salesman is almost imperative. New suggestions and new ideas are constantly brought out almost unconsciously in these interviews.

Once again a higher and more helpful co-operation is possible between the engineer and the man of the industry in commercial practice, and it is gratifying to note that this new spirit of helpfulness has again been initiated in the West.

The increasing engineering and commercial activity between America and Oriental points makes the study of the customs of the people in the Far East of timely importance. Some idea of the labor situation can best perhaps be arrived at by discussing certain of the prevailing racial characteristics one encounters in going from country to country in that section of the world.

In traveling from Japan and China to the Philippine Islands, one is very forcefully impressed with the extreme differences of human activity displayed. The Japanese and Chinese are industrious and active in the extreme. They never stop work. One sees them in the early hours of the morning at their tasks, and late at night they are industriously engaged in computing up their household accounts. Undoubtedly climate alone is not to account for this, since in Hong Kong, although the humid, enervating air of the Philippines prevails, still the native is industrious. The keen

struggle for existence has undoubtedly been the most potent factor in the development of their native zest for work.

What a change when one observes the native Philippino! The possessor of a rich, fertile soil, unhampered in population, the Philippino works for a living as a secondary consideration. Hence, the question of labor is easily solved in Japan and especially in China, but in the Philippine Islands it is still a serious problem.

In Japan a tremendous socialistic wave is sweeping the country. The struggle for life has brought them face to face with an intense study of socialistic problems. It is believed that the zest with which they are prosecuting the working out of their labor conditions will eventually result in much good coming from it.

Nearly all the domestic work and such other work wherein Oriental labor is employed in China or upon ocean going vessels is done through the "Number One" boy. He it is who is the responsible party, employs the other boys, and generally acts as the guiding spirit for the work. Incidentally, of course, he it is who receives all the commissions, rake-offs, and other subtle rewards which he is able to wring out of all natives stores and houses with which his master deals.

The house boy service is, however, exceptionally efficient, and with all its drawbacks, is most to be desired in China. In Shanghai, a house boy may be gotten to keep himself with board and meals and be always at your beck and call for five dollars a month (American money). And when one says to be always at your beck and call, it may almost be taken literally, for your "room boy" wakes you up in the morning, puts within near reach your collar and necktie which he has observed that you fancy most, serves you tea while you are still in bed, prepares your bath, and in fact does every conceivable thing for you that your fancy may desire.

It is always "Boy, do this," or "Boy, do that." An enthusiastic American who was a resident of Shanghai, asked how he liked living there, replied: "Oh, I like it, for I've heard the Call of the East." In response to the question, "What is the Call of the East?" his quick answer was, "Boy!" The Oriental luxury and ease with which one accustoms himself in the Far East is indeed hard to break away from when returning to America.

The one fact above all others that stands out when one reviews in mind the employment of labor in the Orient, is that the laborer, after all, is human, possessing a heart that may be softened and hands that may be quickened directly in proportion to the humanitarian effort shown by his employer:

THE NEW JOURNAL SERVICE: Proper and effective advertising through the local press is a subject of great importance in the merchandising of electrical ware. It is with unusual pleasure that we initiate in this issue a series of articles on "Odds and Ends of Selling Psychology" by H. A. Lemmon, salesmanager of the Truckee River General Electric Company. Mr. Lemmon is a well-known authority on this subject, and as a consequence this series will undoubtedly be followed with widespread interest.

Another series of timely articles is that on Inductive Interference by D. I. Cone, an investigator for the Joint Committee on Inductive Interference, who has devoted years of study to this subject, and now steps down this intricate matter in language easily understood.

The successful closing of the subscription contest of the Journal of Electricity, announced in full elsewhere, has marked a signal advance in the effective circulation of the Journal. With such substantial backing shown on all sides by readers of the Journal of Electricity, its prestige is at once placed upon a higher plane of usefulness. The Journal of Electricity extends to all who have aided in this timely campaign its deepest and heartfelt appreciation.

THE MOST POWERFUL TURBINE IN THE WORLD

BY F. SCHMIDT

(Among the world records in the electrical field of which the West is proud is to be numbered the installation on the White River of the most powerful turbine in the world. In view of the interest attaching to the electrification of the Chicago, Milwaukee & St. Paul in its extension westward, and the call for new power, this subject is one of particular appeal. A description of the plant, with the problems and achievements in construction and operation, is here presented by a man who is engineer in charge of design in the hydraulic department with the firm manufacturing the turbine.—The Editor.)



Intake gates and gate house

The commercial results obtained from the operation of the electrified Rocky Mountain Division of the Chicago, Milwaukee and St. Paul Railroad have been so eminently satisfactory that it was decided to immediately proceed with the electrification of the Cascade Mountain Division, which extends from Othello, east of the Columbia River over the Cascades, to the end of the transcontinental line at Seattle and Tacoma. The western slope of the Cascade Mountain Division will receive about 25,000 kilowatt of electrical energy from the Puget Sound Traction, Light & Power Company,



Bellmouth of the flume, first basin, under water



600,000 yard cut and covered flume—outlet canal

at Seattle, Wash. This concern has a number of hydro-electric plants, the largest of which is the so-called White River Plant near Sumner, Wash. The plant with an initially rated output of 36,000 horsepower developed by two hydro-electric units, was placed in commercial operation in November, 1911, and has since delivered power uninterruptedly and without involving expenses for repair. It was found that the turbines and generators can carry without difficulty or detriment to their efficiency, a total load of 30,000 or 40,000 horsepower on the shaft.

The plant has been laid out with

a view of maintaining the highest economy of water since it is combined with a large storage capacity, which serves to furnish the necessary water during dry season.

The course of the White River, a typical mountain stream, fed from one of the glaciers of Mount Rainier, is blocked by a timber crib dam near Buckley, Wash., on one of the branches of the Northern Pacific Transcontinental Line. The water is controlled by rugged steel gates and led through a heavy timber flume into a forebay, which serves as a settling basin for the glacial silt carried by the river at times in large quan-

tities. Provision is made for draining and flushing this forebay to prevent its being filled up with deposits.

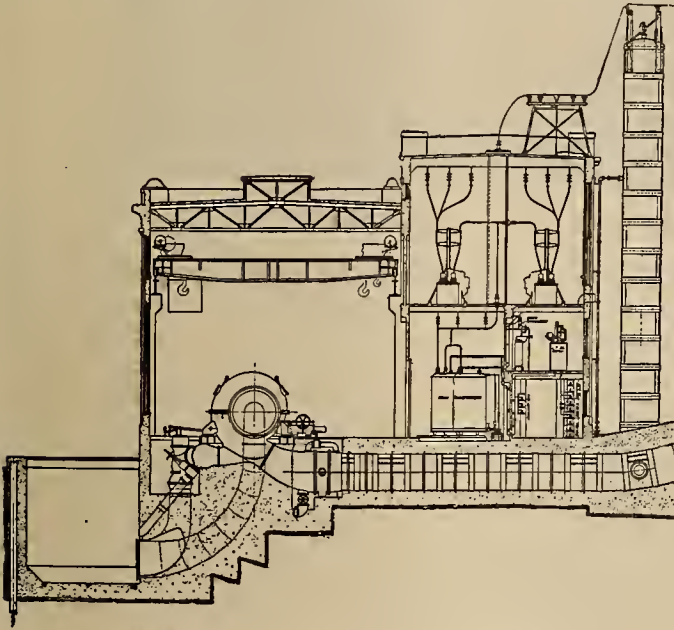
An open canal leads to the storage reservoir, called Lake Tapps, which was a small natural lake now greatly enlarged by raising its water level about 35 feet, and by bringing the storage capacity of this lake up to 2¼ billion cubic feet, equivalent to 18,000,000 kilowatt hours obtained under the net head of 440 feet.

From Lake Tapps the water is carried through a deep open cut and a tunnel about 12 feet in diameter and about 3,000 feet long, intended to carry 1,500 cubic feet per second, which is half of the total ultimate flow. The other half will be carried in an additional tunnel to be built later.

The tunnel ends in a circular forebay about 75 feet deep and 30 feet diameter, serving as equalizing reservoir with spillway, built back in the hill about 250



The generator room



Cross section of the new White River installation

feet from the western slope of the hill. From this forebay three individual steel penstocks are placed in concrete lined tunnels leading to the slope of the hill. Each pipe has a diameter of eight feet at the top and six and one-half feet at the power house, and is about 2,500 feet long. At the point where each pipe begins to slope down there is a steel vent-pipe six feet in

diameter and 85 feet high which again serves to assist the water in its acceleration or retardation during the load changes, and to prevent a collapse of the pipe in case the gates at the forebay are closed.

In order to adhere to the principle of conservation of the stored hydraulic energy of this plant, it was necessary to provide hydraulic equipment which is capable of controlling the bulk of the momentary variation of the commercial load of the Puget Sound Traction System. This variation is sometimes very severe, owing to rapid and large changes of the power required by freight trains of the Puget Sound Traction Company lines.

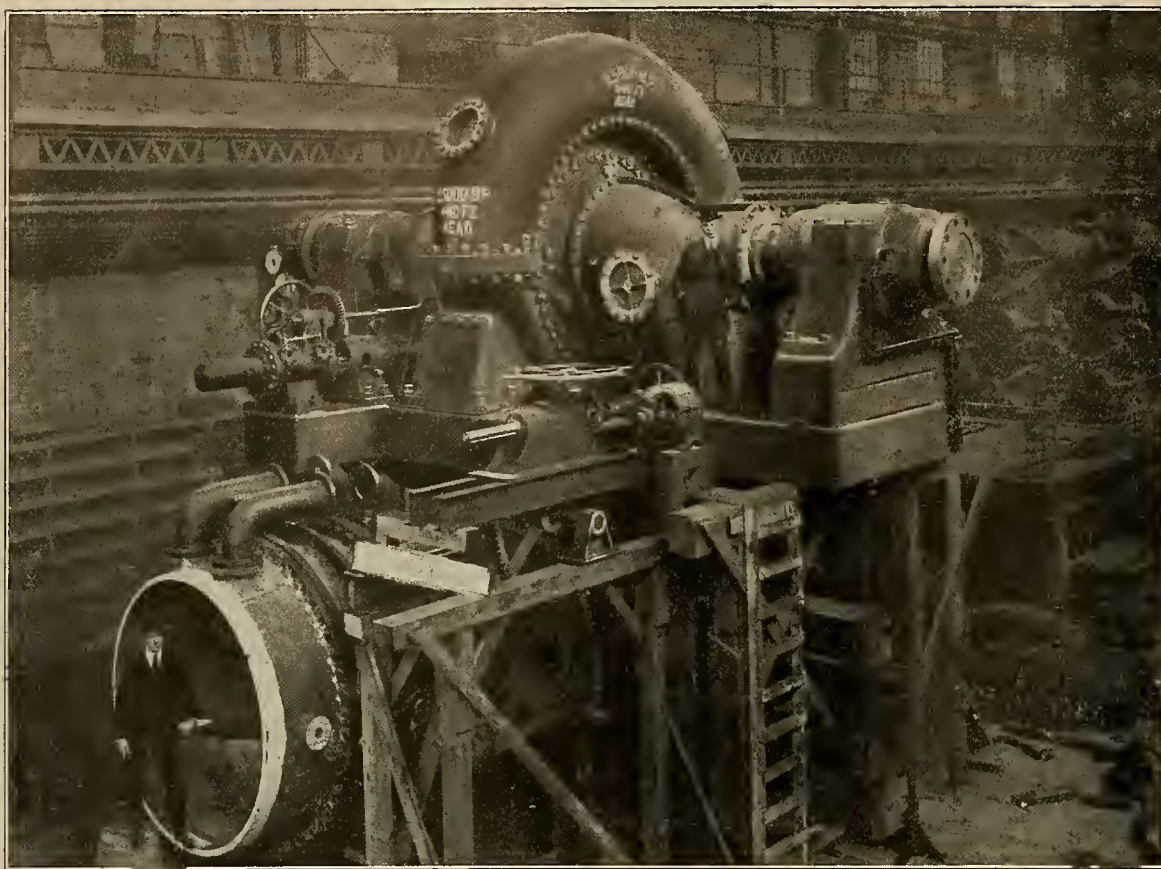
The long tunnel combined with the steel pipe lines, together with the requirement of a water-saving method and of speed regulation under heavy fluctuations of load over a high tension transmission line, offered a problem to the hydro-mechanical engineer, which required careful study and practical experience.

In order to prevent excessive variations in speed and voltage of the power system it was necessary to use a very sensitive governor and to quickly control the gates of the turbine. A sudden change in the flow of the water through the pipe lines and tunnel would cause pressure variation, which would not only impair the regulation but might accumulate to such extent that they would wreck the whole plant. A careful analysis of all the precautionary methods was made and as a result of same it was decided to use:

1. A surge reservoir at the end of the tunnel for the purpose of moderating the surges set up in the tunnel.

Runner and shaft with forged flange coupling and brake pulley





Third unit completely assembled. Note butterfly valve and regulating cylinder

2. Pressure regulators so combined with the turbines that they permit of a sudden release of the water otherwise brought to a stop in the penstock when the governor closes the gates of the turbines quickly. In order to prevent excessive waste of water, these releases or by-passes slowly and automatically close within a rate so adjusted that the flow is gradually stopped without causing any appreciable secondary rise.

3. Air cushion tanks, located close to the turbines which supply energy to same, when demand of load is so sudden that the water cannot accelerate in the pipe line sufficiently fast to prevent a serious drop in pressure.

The proper combination of these three devices, together with a fairly liberal flywheel effect of the revolving parts of the generators, made it possible to attain an accuracy in speed regulation which has been the subject of considerable comment in engineering circles.

The turbines of the initial installation were made of the double discharge horizontal shaft spiral case type of 18,000 horsepower capacity each operative under a net head of 440 feet at 360 R. P. M.

A governor-operated, and a pressure-operated pressure regulator are directly connected to a branch pipe provided on the lower portion of the spiral casing. Each consists of an elbow with a circular disc-valve, opening and discharging water downwardly through a plate steel pipe into the tail race. This disc-valve is connected to a piston subjected to water pressure controlled by a regulating valve, which in turn is relay

operated. The relay of the governor-operated pressure regulator receives its initial motion from a direct connection to the turbine gates. An oil dash pot is so inserted into this connection that the motion of the turbine gates is transmitted to the regulating valve only when the governor closes this quickly, slow motion being completely absorbed in the dash pot. Thus the discharge of the turbine can be quickly switched over from the turbine to the pressure regulator, and is there reduced slowly in accordance with the setting of the by-pass in the oil dash pot, determining the rate of closing motion of the pressure regulator.

The turbine discharges about 450 cubic feet of water per second, and when the flow is stopped through the turbine gates in one and one-half seconds it will discharge through the pressure regulator to its full amount by the time the governor has closed the turbine gates. Thus the velocity of the water in the pipe line is not changed and is slowly reduced thereafter so that no serious pressure rises occur.

The relay of the pressure-operated pressure regulator receives its initial motion from a plunger weighted by a compressed spring. This plunger is subjected to oil under pressure out of a tank which communicates directly with the water under pressure in the main penstock. Any variation of pressure changes the compression of the spring, this causing an initial motion of the relay of the pressure regulator. The spring is so set that pressure rises exceeding 15% above normal cause the pressure operated pressure regulator to begin its function.

As a third means of protection of the turbine, a

bursting plate is placed in the neck of the "Y" pipe making connection between the turbine casing and the two pressure regulators. The bursting plate is to give way only in case the pressure should rise to 50% above normal. A hand-operated gate valve permits of replacement of this plate without necessitating interruption in service.

After the units were placed in commercial operation elaborate efficiency and regulation tests were carried out. It was found that the efficiency exceeded 90% and was still above 80% at about one-fifth of the total load.

The full load of 20,000 horsepower was thrown off suddenly, causing the governor to close the gates quickly. The speed did not rise more than 12% above normal and the maximum pressure rise in the pipe line above normal did not exceed $5\frac{1}{2}\%$, as against a guaranteed pressure rise of 15% and a speed of 18%. On a 20% load change, the speed did not vary more than $1\frac{1}{2}\%$, as against a guarantee of 5%.

After five years of continuous service, one of these turbines was opened for careful examination. The parts subject to hydraulic and mechanical wear and tear were measured up and photographs taken in order to establish proof of their durability.

It was found that the surfaces in contact with water at high velocity, as for instance in the guide case and in the runner chutes and discharge elbows, were absolutely free from hydraulic wear, the finishing tool marks being still perceptible all over.

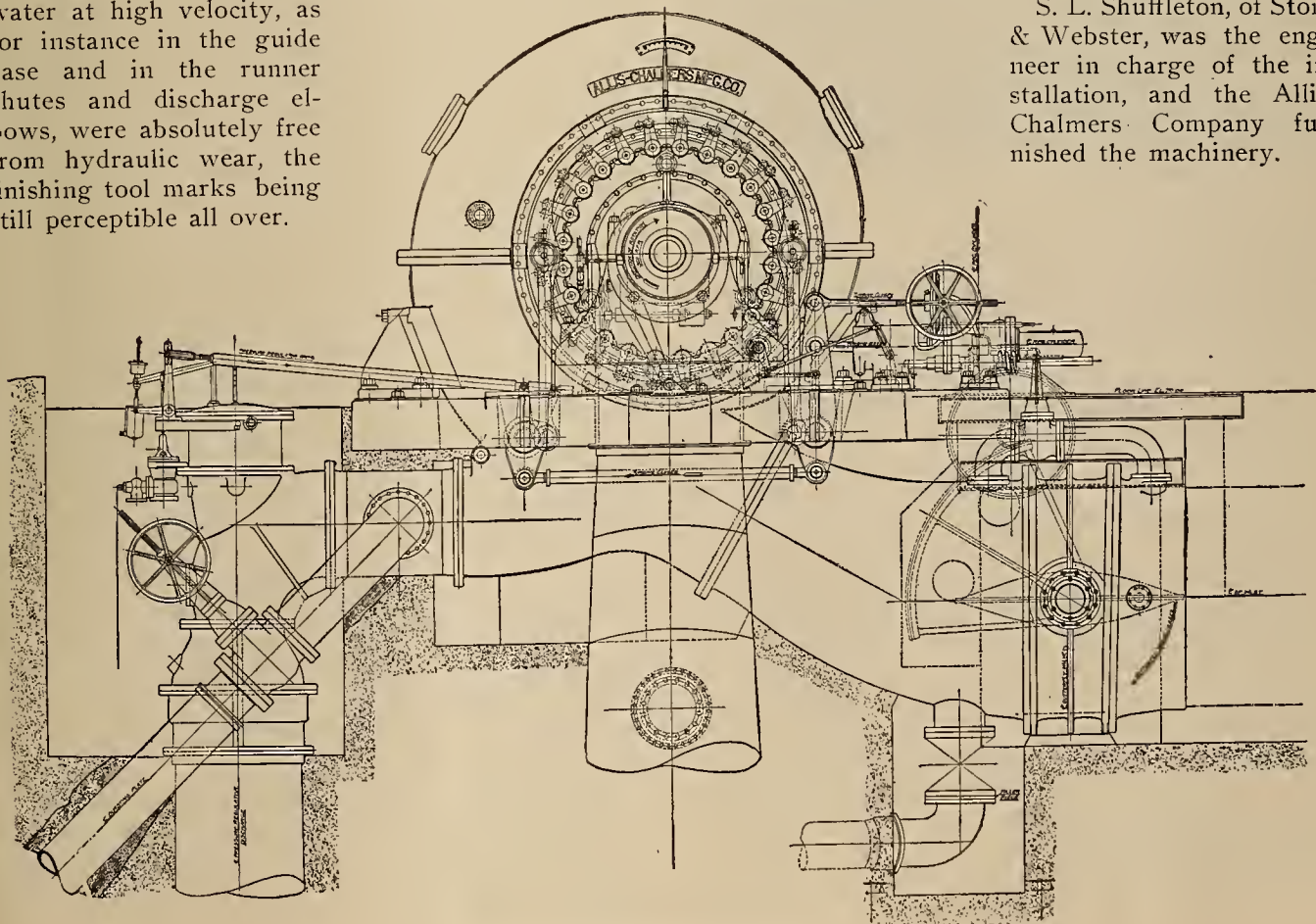


Roof towers, outside line switches and air chambers

The results of this examination were so gratifying that it was decided to build the third new unit practically a duplicate of the first two units. The excellent results obtained as regards efficiency and speed regulation encouraged the company to increase the rated horsepower from 18,000 of the original contract to 23,000 horsepower without increasing any parts except those directly affected, that is the runner, shafts, guide vanes, etc.

It is expected that 25,000 horsepower will be delivered by this new turbine to the generator shaft and that both the efficiency and the speed regulation will be as satisfactory as they are with the first units.

S. L. Shuffleton, of Stone & Webster, was the engineer in charge of the installation, and the Allis-Chalmers Company furnished the machinery.



Front view assembly of new unit

PRESENT STATUS OF INSULATOR DEPRECIATION

BY C. E. OAKES

(The difficulties of early failure of insulators have presented a problem of nation-wide importance on high-voltage lines. Several of the Pacific Coast companies have already gotten together to try and devise adequate acceptance tests, and the federal authorities have carried on numerous experiments with that end in view. The results of these investigations, the advances made and the needs still remaining, are here authoritatively reviewed by a man who is special investigator for the Bureau of Standards at Washington, and who has been intimately connected with this work.—The Editor.)

The rapidity with which deterioration and ultimate failure of insulators in every part of the country is occurring has caused the problems to be investigated by various individuals or groups of individuals, in order to arrive at a satisfactory solution. Within the past two years a number of companies operating on the Pacific Coast, realizing the importance of the problem, collaborated in conducting an extensive investigation of the effect of porosity on insulator deterioration and of the possibility of using insulation resistance as a possible criterion for acceptance tests. The successful solution of the problem calls for like co-operation between the operating companies of not only one community, but of the country as a whole. Insulator troubles are experienced in a greater or less degree on every high-voltage line in the United States. The co-operation so successfully started in the West should be so extended as to be nation-wide. Perhaps the best instrument suited to this purpose would be one of the engineering societies, actively supported by the operating companies.

As is evidenced by recent papers on the subject, engineers recognize two main hypotheses by means of which insulator failures can be explained. These are (1) porosity and (2) mechanical cracking due to expansion of the metallic and cemented parts. These hypotheses are built upon the results of numerous investigations of effects and not causes. Herein lies the difficulty in solving the problem. If the causes of insulator deterioration were known, an effective procedure in investigating them could be more easily developed and carried out and means specified to alleviate the condition. The very fact that two such hypotheses exist is prima facie evidence that the analysis of operating data on the failures of insulators and of the contributing causes thereto have not been extensive enough. It is in this field of investigation that co-operation among the various operating utilities is especially beneficial and desirable.

Porosity, and the resulting absorption of moisture, a measure of which is the insulation resistance, is of course present in all insulators to a greater or less degree. Up to the present time, however, no evidence is at hand to justify the inclusion of a resistance measurement in an acceptance test from which the length of time the insulator will successfully operate without excessive depreciation can be foretold. Numerous experiments have proved that porcelain rapidly becomes an electrolyte with an increase in temperature. When it is also considered that porcelain which has absorbed more or less water is already an electrolyte, failures are to be expected. It is not reasonable to assume that this cause of insulator depreciation will ever be eliminated. The rapid strides which insulator manufacturers have made during the past four years in perfecting

the control of their product during the process of manufacture, has resulted and no doubt will continue to result in an ever-lessening percentage of total failures due to absorption. An extended analysis of operating data on lines on which late designs are now in service is needed.

There are very good reasons for believing that a large percent of the total failures are due to cracking of the porcelain in the insulators. The many factors which contribute to the mechanical stresses to which an insulator is subjected complicate the problem of ascribing causes to a given failure. Among the factors which cause undue stresses can be named:

- (1) Faulty design of the insulator itself. Certain designs, on subjecting the insulator to abnormal and rapid changes in temperature, allow greater expansion in one part than in another and hence develop high internal stresses.
- (2) The thermal coefficient of expansion of porcelain is about one-half that of steel.
- (3) Stresses set up in the insulator due to the change in volume of the cement under varying weather conditions.
- (4) The gradual increase with time in volume of the cement.

The earlier types of insulators, especially the pin type, had parts of the body of the insulator so proportioned in relation to one another that high internal stresses resulted during the process of manufacture. While these stresses were existent, their presence during the first year of service was not harmful. However, the effect of cyclic changes in weather, the growth of cement and the difference in the rate of expansion of the cement and porcelain with variations in temperature, combined with the initial high internal stress, produced an ever-increasing number of cracks. In order to overcome this difficulty material changes in design were made. The thickness of the shells was made more nearly equal and the contour so designed that the area of the bearing surface between cement and porcelain was greatly reduced, thereby shortening the "lever arm" on which the force, resulting from expansion of the cement and other shells of the insulator, acts. The general tendency, both in pin and suspension types, has been to reduce the area of the cemented surface to a minimum consistent with mechanical reliability. The older method of grooving the surfaces which are in contact with the cement has been replaced by sanding these surfaces with coarse grain particles. By this process a better distribution of stress over the entire surface is obtained.

The enormous stresses in insulators employing metal parts rigidly attached to the porcelain, which result when the temperature is greatly different from the assembly temperature, are known, and this condition has led to many improvements in design. As small

caps as are practical to use from a mechanical standpoint are now employed, care being taken in assembly to insure an adequate separation between the cap and the porcelain at every point. In the present cap-and-stud type, the possibility of eliminating the shearing stresses in the porcelain, occasioned by the change in length of the metal with varying temperatures, is remote. Herein lies an important field of investigation. The development of a cement elastic enough to accommodate all changes in length due to temperature is needed. The other possibility is to eliminate cement from the insulator altogether, and at the same time to introduce no equally undesirable features.

The question of the effects produced by the changes in the volume of the cement with varying temperature changes has received consideration from time to time, manufacturers being especially diligent in their quest for the best quality of cement obtainable. Investigations undertaken by various individuals have disclosed the fact that cement will contract and expand when subjected to variable moisture conditions. The experiments¹ of Mr. A. H. White have shown that cement will contract when changed from a state of moisture to a dry condition, and will expand when subjected to a reversal of the above conditions. Furthermore, it was shown that a cyclic change from a moist condition to that of dryness and back to a moist state will cause a gradual growth in the cement. This increase in length can be explained on the theory that hydration is accomplished slowly, the effect of the alternate expansion and contraction acting in such a manner that the inert material which had previously been sealed up is exposed to the weather and is then hydrated, this action being accompanied by a slightly increased volume. When it is considered that the thermal coefficient of linear expansion of cement is 0.0000055 per degree of Fahrenheit (the temperature coefficient of porcelain is 0.0000017), and that the increase in length as shown by these tests is from one hundred to five hundred times this amount, the magnitude of the resulting stresses can be more readily realized.

Knowing that this condition obtains, the next logical step would be the production of cement which would be practically entirely hydrated during the first few days of drying.

In accordance with the generally accepted theory that hardened cement is a colloid, each particle of cement on reacting with water swells and becomes a gelatinous mass cementing the particles of sand together. The size of the particles of cement will therefore determine the relative amount of water which each particle takes up, an arrested stage in the hydration being reached where the water is no longer able to easily force its way through the colloidal covering of the kernel of cement. Therefore the finer the particles of cement the more completely will they be hydrated. In order to see what results could be expected from the use of such cement, Mr. H. S. Phelps and Mr. J. C. Pearson, of the Bureau of Standards, in March, 1917, undertook some preliminary experiments, which are still in progress, the results of which are summarized below.

¹Proceedings American Society for Testing Materials, Vol. XIV, Part II, 1914, p. 204.

Several receptacles, or "pigs," were constructed as illustrated in Figure 1, the legs being provided for the greater accuracy obtainable in reading the expansion. The radius of the cement cylinder was 0.6 in., and the radius of the leg measured to the center of the ball as shown was 1.7 in. Duplicate samples were made up from cement of various degrees of fineness and of the proportions as stated in the following table, and after the initial setting, were placed in water, and kept under water throughout the experiment.

A. Neat cement.

B. Cement (total volume taken equal to that used in A) passing 200-mesh sieve; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to the particles of cement retained on 200-mesh sieve.

C. Cement less than 0.00252 in. (0.064 mm.) in diameter resulting from total volume taken equal to that used in A. Sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to particles of cement removed.

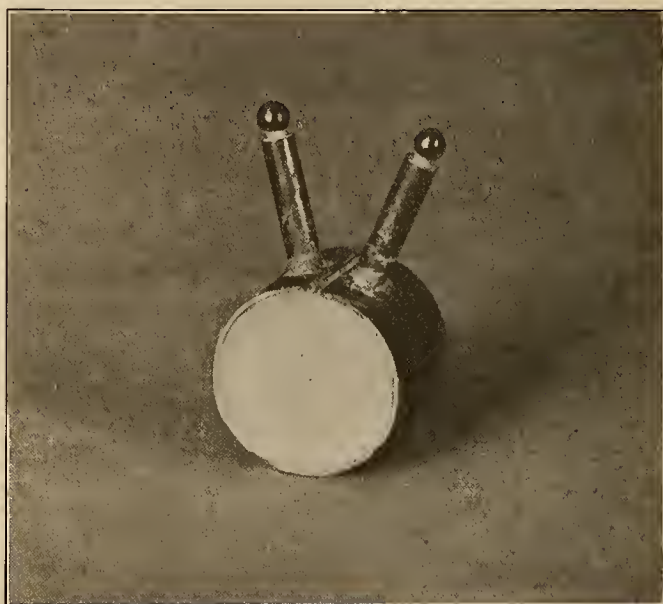


Fig. 1.—A receptacle or "pig" for testing the expansion of concrete

D. Cement less than 0.001575 in. (0.04 mm.) in diameter resulting from total volume taken equal to that used in A; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to the particles of cement removed.

E. Cement less than 0.00078 in. (0.0198 mm.) in diameter, resulting from total volume taken equal to that used in A; sand [diameter of particles 0.0082 in. (0.208 mm.) to 0.0116 in. (0.2835 mm.)] was added equal in volume to particles of cement removed.

Samples of each of the above mixtures were broken after a seven-day interval with the following results:

- A. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
- B. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
- C. Slightly above 7819 lbs. per sq. in. (551 kg. per sq. cm.)
- D. Slightly above 7850 lbs. per sq. in. (553 kg. per sq. cm.)
- E. Slightly above 5978 lbs. per sq. in. (421 kg. per sq. cm.)

The ultimate breaking strength of test pieces A and B slightly exceeded the capacity of the testing machine. However, from tests on other samples from the same cement it is known that the breaking strength is about that indicated.

Figure 2 shows the increase in length of the specimen up to date, the letters on the curves corresponding to those in the table. The curves are an average of the

readings of duplicate specimens. The error of measurement was probably plus or minus 0.002 mm. The uncertainty of measurement due to uncontrolled conditions was probably plus or minus 0.011 mm. The striking characteristic exhibited by the curves is the very much greater growth exhibited by the specimen containing the coarser particles of cement, and the rapidity with which specimen E attained its maximum growth, which was probably in the neighborhood of 60 days. The maximum growth has not been reached in any one of the specimens except for specimen E. The maximum percent increase shown by specimen E was 0.011, and by specimen A, 0.0945. While the strength of specimen E is lower than the others, it is thought that its strength will not decrease with age, while the others will probably diminish to a considerable extent. This is anticipated in specimens A, B and C particularly, and is a well-established phenomenon in normal cement.

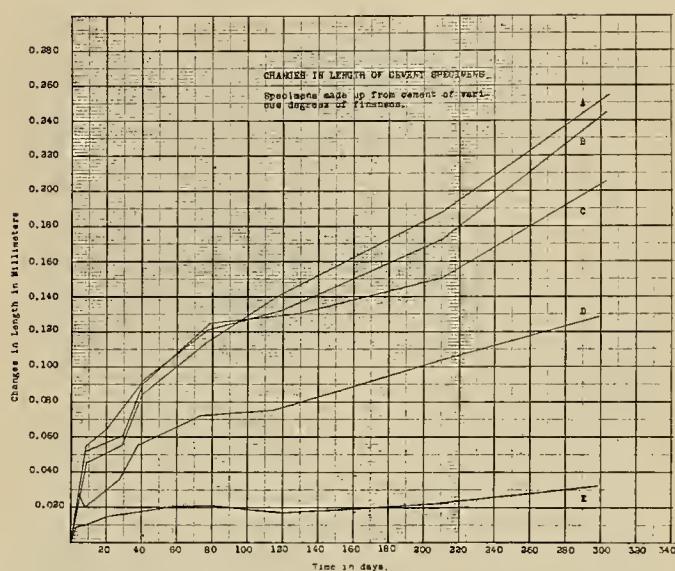


Fig. 2.—Chart showing increase in length of the various specimens of concrete

In order to obtain the required degree of fineness the cement used in the specimens C, D and E was subjected to a special process of air-pressure separation. This method is not commercially in use at present so far as known, but there are no physical difficulties to impede its rapid development and commercial introduction, providing the demand for such a product is justified. These experiments are not conclusive and more extensive tests are needed, but they will serve to show the results which can reasonably be expected from a proper knowledge of the proper manipulation of the cement.

Much has been written on the subject of porosity and cracking in insulators, special importance attaching to the papers of Professors Creighton and Ryan and the latter's associates in the technical press, and of Messrs. Austin, Peek, Brundige and Peaslee, which have appeared from time to time in the proceedings of the American Institute of Electrical Engineers. There has, however, been no concerted effort made on the part of any group of investigators to gather together and analyze operating data bearing on the question.

A great number of the faults which have appeared are exhibited only by the older types. Whether the

newer types are also exhibiting as large a percentage of failures is doubtful, and can be answered only by a thorough analysis of operating data collected from numerous sources. Time is, of course, the determining factor in showing up the performance of the insulator and it can be safely said that the development of the art in design and manufacture has been so rapid that the time during which the newer types have been in operation has not been sufficient to really judge their performance.

Such analysis of operating data as have appeared in the technical periodicals have been accounts of experiences of individual cases or companies. These are in a sense special cases, and as such, dependence can not be placed on the conclusions reached. The need, then, for a thorough review of the whole situation from an operating standpoint, covering representative utilities in various parts of the country, is evident. Such an investigation could without doubt be most easily conducted by one of the engineering societies whose facilities for co-operation and intercourse among the various utilities is unexcelled. The difficulties to be encountered in an analysis of this kind would be the lack of reliable records and the inevitable "personal equation" which nearly always enters. Conclusive results must be based on reliable evidence and data should therefore always be taken from chronological records. Opinions as to possible causes of phenomena observed should not be the basis from which conclusions are reached; an accurate description of the phenomena observed is much more desirable.

An extensive study of operating data will solve several problems, solutions for which have heretofore been obtained only "by rule of thumb" methods. It should be entirely possible to establish an empirical relation between a given standard of performance and the frequency of inspection and re-insulation of lines on the basis of the best obtainable economy. The question of the effect of mechanical loads can be determined from the relative number of failures of strain and suspension types which have been in service under similar conditions. Whether the element of time during which an insulator is under mechanical load is a factor which will contribute to the deterioration in strain insulators is not known at present.

Other much mooted questions which could be partially or wholly solved by an analysis of operating data are (1) the relative amount and cause of depreciation of insulators in storage; (2) the effect of the season of the year on the number of failures; (3) the relative number of failures ascribable to the use of cement; (4) the average number of failures for the various disk positions; (5) effectiveness of arcing horns and of ground wires.

There are many experimental investigations which can be undertaken with the assurance that the results obtained will prove valuable. The development within the past few years of a type of suspension insulator which does not employ cement in the assembly, and in which the distribution of electrical stresses is practically uniform, presents a problem for the research investigator. Researches conducted on this type, as compared to other types, which will show the distribution of stress, would be exceedingly valuable. The

method employed by J. F. H. Douglas² in his investigation of the distribution of magnetic flux in machines, and more recently by Chester W. Rice³ in his investigations of the distribution of dielectric flux around bushings, could be adapted to this investigation.

The problem of obtaining a suitable method for measuring the porosity in insulators is still unsolved. The measurements and comparison of the power-factor of insulators by a bridge arrangement has been suggested as a possible method not only for the measurement of porosity but also as a basis for acceptance tests. This method, while giving an average value for an insulator as a whole, will not pick out the individual flaw, which is of course the region of possible failure.

An extensive experimental investigation of the effectiveness of using extremely fine cement, conducted along the same line as the experiments, the results of which are given above, is needed. It is thought that the added advantage gained by the use of such cement will offset the increased cost of its production.

²The Reluctance of Some Irregular Magnetic Fields, John F. H. Douglas, p. 1067 A. I. E. E., Vol. 34, Part 2.

³Proceedings of the American Institute of Electrical Engineers, November, 1917.

A PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(The recent report of the Joint Committee on Inductive Interference, the result of five years' investigation of this problem, is one of the most important achievements of recent years. The subject involves features of such highly technical and specialized nature, however, that there are many even among electrical men who have felt that the report held little of interest for them. This treatment of the subject in a simple and understandable way by an engineer who is connected with the Pacific Telephone and Telegraph Company, and who served as technical investigator with the Joint Committee, should prove of great value. The article is the first of a series which will deal with various aspects of the problem.—The Editor.)

An impression seems to prevail that the subject of inductive interference is hopelessly involved in complicated mathematics, and that an ordinary electrical man has no hope to comprehend it. This is an unfortunate and wrong idea. Most of us have a conception of the working of a transformer (often called

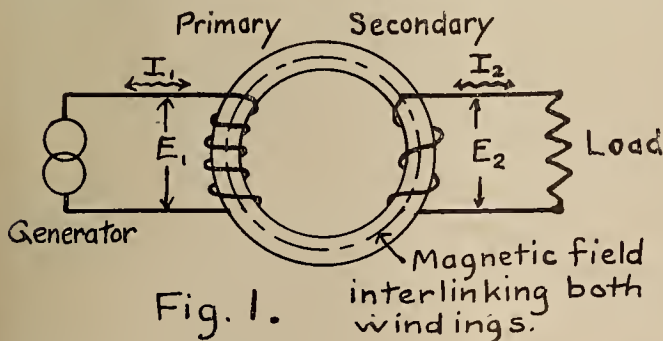


Fig. 1.

an induction coil or a repeating coil), but very few become familiar with the complex relations among dimensions, amounts of copper and iron, efficiency, regulation, cost, etc. In like manner, one need not master the mathematical theory of inductive interference in order to appreciate its character.

Consider a simple example. A telegraph line which runs parallel to a single-phase trolley line is disturbed by "induction." Let us at first pass by the

disturbance due to the presence of the electric charge on the trolley wire, due to its potential difference from ground, and consider now only the disturbance due to the current which flows in the circuit when a trolley car is being supplied with energy.* This current traverses the generator, trolley wire, car wiring, motor, and rails (on earth). The inductive effect of this trolley current on the nearby telegraph line takes place in exactly the same way that energy is transferred

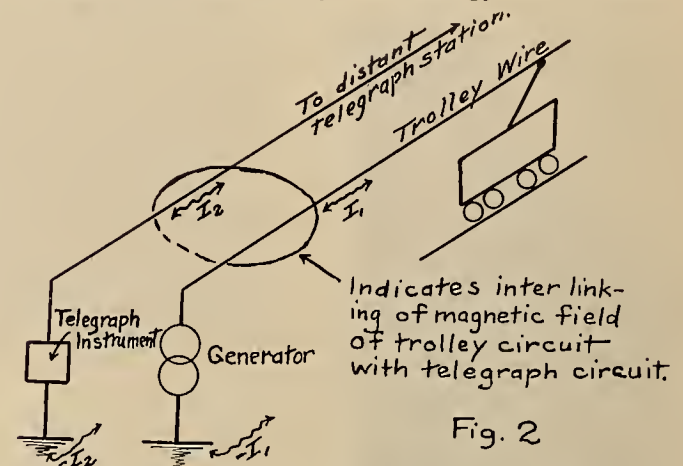


Fig. 2

from the primary to the secondary of a transformer. In Fig. 1 is shown, schematically, an ordinary transformer. A current I_1 is driven through the primary by the generator, at voltage E_1 . This current sets up a magnetic field in the core, which interlinks with the secondary winding. The variation of I_1 changes the magnetic field through the secondary, inducing an electromotive force E_2 in it. The secondary being closed through a load, a current I_2 is set up. Power transformers are so designed that, approximately, the primary and secondary voltages are proportional to the turns on the two windings, and the currents I_1 and I_2 are inversely proportional to the number of turns.

In the case of the trolley circuit and parallel telegraph line, there is only one "turn" or loop. The trolley circuit is, of course, the primary "winding," and the telegraph circuit the secondary. Fig. 2 illustrates the relations. The magnetic field due to the trolley current interlinks with the loop composed of the telegraph wire and earth and, the loop being closed through the telegraph instruments, the variation of the trolley current sets up a current in the telegraph circuit, just as in the case of the ordinary transformer.

The simple relations of primary and secondary voltages and currents described above do not hold, however, since in this case there is no appreciable effect on the trolley circuit (the primary) whether the telegraph circuit is opened or closed. This results from the very small degree of coupling of the two circuits.

The frequency, or rate of variation, of the induced current in the telegraph circuit is the same as that in the trolley circuit, just as an ordinary transformer does not alter the frequency. When the induced current in the telegraph circuit approaches the telegraph signaling currents in frequency and amount, the interference becomes serious.

*A third cause of disturbance is that part of the trolley current may follow the telegraph wire as a "return" path instead of the rails on earth.

THE MAKING OF AN AEROPLANE

(The giant forests of Oregon must supply the great bulk of spruce necessary in the manufacture of aeroplanes. This wood, which is used for the entire framework of the machine, is found only in certain favored localities, of which Oregon furnishes the major supply. The converting of the raw product into machine parts is, therefore, the typically Western end of the manufacture, although some factories which turn out the machines complete are also located on this coast. The story of the part electricity plays in this manufacture is here interestingly told.—The Editor.)

THE MAKING OF AN AEROPLANE



Shipping the spruce to market

THE war has brought many industries into being on the Pacific Coast, of which perhaps none is more interesting than that of the making of aeroplanes. The O. K. Jeffery Airplane Factory of Portland, Oregon, is one of these new enterprises built to meet a war need. As with so many of the by-products of war, however, it has its application to peace—for the developments of the future promise a more extensive use of aeroplanes in the commercial life of the world and an ever-growing demand.

The factory is electrically operated throughout, the spruce being sawed into shape by electrically operated saws and turned and planed and polished by electricity. Aside from the present equipment in machinery and lighting, the company is planning extensive additions. The following tabulation of power equipment shows how vital a part electricity is playing in the production of our aeroplane fleet:

Electric Power Equipment

One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—air compressor.

One 5 horsepower, 220-volt, 3-phase, 60-cycle induction motor—wood lathe; sander.

One 5 horsepower, 220-volt, 3-phase, 60-cycle induction motor—band mill; jointer.

One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—mortise machine.

One 7½ horsepower, 220-volt, 3-phase, 60-cycle induction motor—sander; shaper; boring mill.

One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—cut-off saw.

One 15 horsepower, 220-volt, 3-phase, 60-cycle induction motor—two planers.

One 3 horsepower, 220-volt, 3-phase, 60-cycle induction motor—emery wheel; drill press.

One 25 horsepower, 220-volt, 3-phase, 60-cycle induction motor—blower.

One 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor—elevator.

One 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor—rip-saw.

One 7½ horsepower, 220-volt, 3-phase, 60-cycle induction motor—cut-off saw.

One 50 horsepower, 220-volt, 3-phase, 60-cycle induction motor—planer.

One 25 horsepower, 220-volt, 3-phase, 60-cycle induction motor—future additions.

There are eleven circuits of lights.

The factory is now engaged in turning out complete wooden parts for various airplane manufacturers who are supplying the government with machines—the Curtis Company, the Standard, and the California Aviation Company.



WHERE THE TIMBER IS CUT

A giant logger in the Cochran Mountains taking out spruce and cedar logs.



AEROPLANES AS THEY GROW

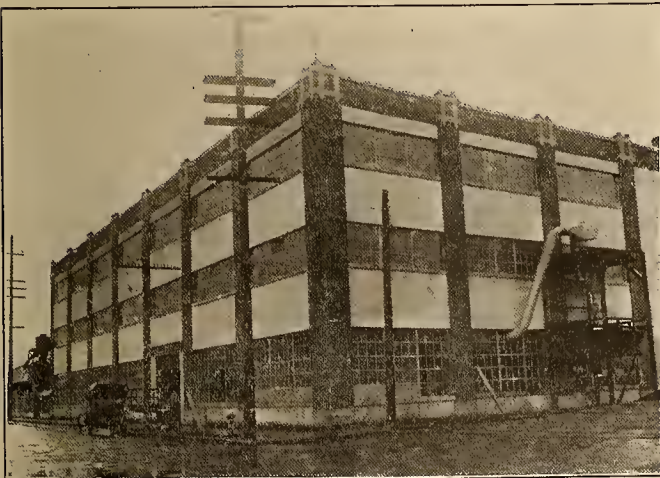
White cedar (the tree to the right) and the spruce, which is shown at the left, are both used in airplane construction. Only the most perfect trees can be used.



THE MACHINE

Small contracts for finished aeroplanes are let by the government in the West, but the great contribution of the country this side of the Rockies is in the wood itself and its conversion into the airplane parts to be shipped East for assembling. Several complete machines are now under process of manufacture in this plant.

All parts are manufactured from select spruce, in accordance with government requirements, and comprise beams, struts, webs and engine beds. Pontoons are also built for seaplanes, and, although the company has no contract in this particular, it now is negotiating with Eastern factories to construct seaplanes for the Navy. These hydroplanes or seaplanes will be constructed completely at the local factory, ready for the installation of the engine, which the government furnishes in all cases.



WHERE ELECTRICITY PLAYS ITS PART

Exterior view of the O. K. Jeffery Airplane Factory, Portland, Ore. Note the absence of chimneys—the machinery throughout is run by electricity.

The factory has produced one complete plane and is working on two more, although the bulk of its efforts is directed toward the manufacture of spruce parts for Eastern factories. One of the planes now under construction is a flying boat, an actual hull, designed exclusively for use on the water.

Mr. Jeffery has been granted authority from the government to operate on the construction of spruce parts for airplanes, and the factory is turning out a standardized product of the first quality. Permission was made necessary when the government assumed control of the spruce situation, and only authorized factories are permitted spruce wherewith to carry on their work.

There are many American spruces, but the species in demand is *Picea Sitchensis*, or Sitka spruce, found on the Pacific Coast from Northern California to Alaska, and reaching its best development in Oregon and Washington.

Oregon has perhaps 60,000,000,000 feet of this species, but little is in pure spruce forests easy to reach. Of the 250,000,000 feet of spruce which has been produced annually in Oregon and Washington, perhaps 15 per cent is suitable for aircraft purposes, which demand not only freedom from knots, sap-pockets and like defects, but absolutely straight grain and a growth not more rapid than six annual rings to the inch. Even the best logs yield only a portion near the outside of such material; many yield none.

A single defective curve would disqualify the timber, for on that slight imperfection might hinge the victory or defeat of an American flier in combat.

The location of an airplane factory at Portland, Oregon, is ideal in that it is situated in the center of the spruce supply not only of the United States, but of the world as well, at present.

THE ENGINEER

BY THEODORE A. LEISEN

When the earth was young and our race was crude,
And the needs of the world were few,
The man of skill found no place to fill;
There was nothing for him to do.

But time in its steady, unceasing whirl,
Wrought changes both far and near,
And the wants of man grew by span and span,
Making work for the engineer.

And so year by year and from age to age,
With the growth of wealth and thrift,
There arose a demand for the skillful hand
Of the man of mechanical drift.

As science and craft and the useful arts
Increased in scope each year,
Came a call for the man who could build and plan,
And they called him an engineer.

CONSERVING LABOR IN A JOBBING BUSINESS

BY E. J. WALLIS

(It is only when the necessity for economy comes that we realize how much we spend. The jobber, with the rest of the nation, faces the need and the duty of conserving labor. How this may be done in many little ways and in a few big ones is here pointed out in an inspiring article. The author, who is Pacific Coast manager with the Western Electric Company, recently spoke eloquently on this subject before the Pacific Coast Supply Jobbers at their Del Monte convention.—The Editor.)

It may be that as a by-product of the war we can make progress toward that jobbers' ideal, when he will cease to quote any price on one of some penny thing for which a proper jobbers' quantity should be established. Perhaps the original wholesale grocer would not have refused to open a can of sardines and ship one greasy fish. Certainly if he were conscientious, he would not refuse an order for one when he had quoted case lots at \$40.00 per case, dozen boxes \$3.60 per dozen, less than dozen boxes 35c per box, less than a box 5c apiece.

And while we see the value of the promotion of standards, why not think about what might be considered standard service. We have all seen such claims as this: "We ship the same day we receive the order." Many of us have made such claims, and are honestly making that sort of effort. But is it fair to ourselves or the buyer to represent that sort of service as standard service. Is he not induced to expect a service that cannot be given him by any producer or distributor of electrical apparatus, specialties or some supplies? The value of so-called standard service would be largely uniformity. If a buyer knows that his order will be shipped promptly and his routine order is placed sufficiently in advance of his requirements, as it should be, he will receive service that should satisfy his demands, and it will be a service that will not be a strain or an extravagance on his supplier.

The large retail merchants have been quick to recognize the opportunity to reduce gratuitous accommodation and reasonable restrictions on the return of goods have been introduced. In the electrical trade, while we have not been free we have been at least liberal in sending out samples and specialties for a period on loan. It is apparent that each case carries with it a demand for a certain amount of supervision and effort that we may be sure that our property is returned or billed and paid for. To the extent that this practice is useless we may try to introduce reasonable restrictions.

We can only hope to suggest some of our opportunities for office and warehouse economies, and it is more important that we get the right point of view than to attempt to catalogue each and every chance that may be open to us.

The character and expense of a sales department in a supply jobbing business is determined as a judgment of the executives of the business, and without doubt the most important and difficult judgment that must be made for the business.

The foundation of the decision will be the amount or volume of sales to which the business aspires, and the ever-present incentive for an expanding business. In forming this judgment certain important consider-

ations will be given due weight. Any given volume of business demands a suitable financial support, and an ambition for an expanding business will be accompanied by the financial ability to realize on such ambition. Most industries at this moment are experiencing some difficulty in acquiring the needed capital for their ordinary affairs.

There is much talk now of a governmental supervision of capital investment, and it is said that those seeking to make large investments at this time are laying their plans before government authorities for criticism and endorsement, and it is expected that the Administration will ask Congress for authority to license private investments in order that no other need may compete freely with the national needs. We understand that in England supervision is extended to such minute details of private enterprise as painting a house or building a fence. That is a phase of a conscription of wealth generally accepted as less restrictive than the conscription of men. It is clearly a patriotic duty, therefore, to justify the absorption of additional capital that follows an expansion of a business.

Because of this restriction, most industries are not making plans that require unusual capital. There are notable exceptions, but under circumstances of which we have a general appreciation. There is nothing in the attitude of our banks to indicate that they are prepared to extend cheerfully larger accommodations to the jobbing business that sees in present conditions an opportunity to undertake a grand expansion.

But if capital conditions require no consideration or are justified, the man-power necessary for expansion may occasion reflection. That any man can feel sure that he will be free to dispose of his services for the next several years as he has done in the past is a proposition open to some debate. For a very large class the question has been answered, and we may expect that methods so comprehensive may ultimately be established as to insure for government service any man whose experience and skill are needed. With so considerable an amount of work that must be done, it is to be hoped that the men who can do that work will be set at it. And further, those of us who are engaged in a business however important, but still remote from anything like direct participation in war supply production, can expect that the desire to be of the greatest service will urge even the most settled and experienced men in the normal industries to seek greater satisfaction and perhaps compensation in those industries that are the products of our emergency.

The decision to seek an expanded business must make provision for success from increased demand by adequate stocks of merchandise. The buying of stocks ordinarily affords opportunity for selection. Purchas-

ing normally is a picking and choosing, but it has been some time since a buyer has exercised his function in just that way. He has been doing more begging, arguing and scolding, only to be confronted after he had ordered, with unprecedented conditions of transportation that interjected further uncertainties into his calculations. It is only the gambler who sells these days something that he has not previously arranged to buy, and from the most substantial and reliable producers. With reference to speculative buying, it is to be expected that some people will endeavor to secure even the essential raw products, notwithstanding government control, entirely on speculation. The government is prepared to deal with such cases, but business has the opportunity to assist in the prevention of such speculative buying whenever it is detected.

But if it be certain that capital, men and merchandise will be at our disposal, the desire for expansion gets all its color from the expectation of profits, and the latter, to be existent, will have to withstand the attacks of an advanced cost of doing business from increased wages, railroad fares, taxes, stationery, postage—everything, in fact, except so far, light, electric power and telephones. And in addition, profits must afford some reserve against the day of a reduction in price of some of the merchandise which we are sure to have on hand when declines in prices occur.

The amount of our sales promotion expense will depend on our ambition with respect to the desired volume for our business, and that volume is really our opinion of what is our proper proportion of the total possibilities of our territory. The possibilities of business, of course, follow general development, and general development today we find has responded to the same general considerations which we have sketched with regard to the circumstances of an expanded business.

The scarcity of men, money and materials, together with hazards to profits, account for the restricted general development which we observe in new buildings and extension work by central stations and telephone companies. If the determination is reached to attain a greater volume under such conditions, a larger per cent realization on the possibilities is, of course, necessary. It is well to keep in mind that a large per cent realization on available business is possible even with a decreased volume of business. If this is not appreciated an increased and unproductive sales promotion expense may be incurred on the supposition that we are losing our share, when the contrary is the true condition.

The extent to which a jobber will incur sales promotion expense will also depend on the amount and character of the service he figures he can profitably give a manufacturer by introducing new lines, novelties and specialties. Most electrical specialties are labor savers, and as such can be introduced as an answer to the labor problem. But those devices that are not labor savers or those articles that expect a market only to the extent that they can displace some older and more standard device, will probably be classified as luxuries, and the buying public is now being educated against any but justifiable and necessary expenditures.

It would seem apparent that our present circum-

stances affect some of the considerations that generate sales exploitation expense. Under ordinary circumstances, our reflections on such influences as we have described would be considered at least pessimistic, but it is indicative of the right spirit that we can view our affairs in such light with a feeling that we are approaching some comprehension of a duty and its responsibilities.

In conclusion, we can all agree that this is a very opportune time to reaffirm our allegiance to the code of business ethics so well appreciated in this association; that we will continue to adhere to such principles because they are substantiated by considerations of real economic value.

WAR SERVICE OF WESTERN UNIVERSITIES

BY CHARLES G. HYDE

As an illustration of what a single institution may be called upon to do, here are some of the special things that have been or are being done at the University of California in connection with the war—a record characteristic of Western institutions:

1. From our graduate and undergraduate body, upwards of 2300 men, of whom 1600 were undergraduates, have already responded to the call to active service in the army and navy, such that for each one a star may be set in the service flag of the University.
2. From the faculty upwards of 75 men have already left to take up a varied service in behalf of our country.
3. The University is conducting a ground school of military aeronautics in which 800 men are now enrolled and into which 100 men per week are entering. A new class enters as a class graduates to the flying school each week.
4. Naval preparation courses are being conducted for men preparing to enter the United States Navy with the expectation of taking examinations for commissions in the line or in the engineer division. This course was inaugurated on January 15, and already upwards of 125 men are enrolled.
5. Navigation courses are being regularly conducted for enlisted men detailed from the Naval Training Station on Goat Island and for men intending to enter the merchant marine. These courses are being given both in San Francisco and Los Angeles. Three hundred men have already received instruction therein. Hundreds of other students are in prospect.
6. A training school for men required in certain branches of the ordnance department has been organized and conducted for some months. Large numbers of men have been detailed to this training.
7. Courses in wireless telegraphy, telegraphy, gas engineering, military mapping and sketching and various other subjects have been introduced to meet immediate needs.
8. The Academic Senate has authorized a course in military engineering, a curriculum for which is now substantially outlined. Men taking this course will be especially equipped to enter the Engineer Corps through competitive examination, as provided for by law.
9. Consideration is being given to the project of developing at the University a course in naval training virtually paralleling that now in force at the Naval Academy at Annapolis. More than 80 per cent of the work now given there already appears in the various University curricula.
10. The University, through its various laboratories, particularly in chemistry, agriculture and civil engineering, has undertaken research and testing work of great value and significance and devices and apparatus have been designed which will doubtless prove of very real use in connection with the present struggle.
11. The establishment of a Bureau of Military Information.



CAMP KEARNY ASSEMBLED

The providing of water, light and heat for the housing and feeding of this multitude was a task which was accomplished in something like a month.

THE CONSTRUCTION OF CAMP KEARNY

BY AUSTIN ADAMS

(The building of a city of fifty thousand, not by gradual growth from the small town stage, but overnight as it were, upon the desert, presents problems in engineering and electrical construction of particular interest. Camp Kearny is one of the most successful of the National Army cantonments, and the story of its growth as recorded here, is one of real achievement. The author is familiar with the actual construction problems met with by the San Diego Consolidated Gas & Electric Company in connecting up the eleven or more miles of wire necessary to serve the camp.—The Editor.)

No longer ago than last August, Linda Vista, California, was just a flag station on the Santa Fe Railway, at the top of the long zig-zag Soledad grade, north of San Diego. The population of Linda Vista and the surrounding mesa for miles consisted principally of half a dozen half-breed Chollo section hands, coyotes, cotton-tail rabbits, and quail (in season). Today, however, Linda Vista has a population of thirty thousand men comfortably established in a scientifically sanitary and scientifically arranged community—"with all the modern conveniences." Truly a miracle of engineering, this creation of Camp Kearny as it is today, from the sage-brush desert it was last summer.

When it became known that the War Department was seriously considering placing one of the great cantonments in Southern California, the "live wires" of San Diego got busy. They offered to meet the government more than half-way, by promising to connect the proposed cantonment with the basic necessities of water, light, heat, transportation, and telephonic communication, if the camp were located on the immense table-land of rolling country some fifteen miles north of the city. After a careful investigation of this and other proffered localities, the Secretary of War finally decided on Linda Vista mesa. San Diego rushed preliminary operations so that the city's end of the herculean task would be ready ahead of time. And the War Department started the ball rolling by turning over the enormous works to the Hampton Construction Company, which instantly mobilized an army of between 4,000 and 5,000 workmen, of all the required trades, housing and feeding them right on the ground.

Thus a good sized town sprang into existence, as it were, over night; and the wilderness rang with the beat of hammers, the scraping of saws, and the boom of blasting. And outward from San Diego came the gangs laying water and gas mains, stringing telephone and electric light wires, and grading the new direct highway to the camp. In about a month, when the

troops began to arrive, everything was ready for them. The contractors, the city, the local public service corporations, had made good.

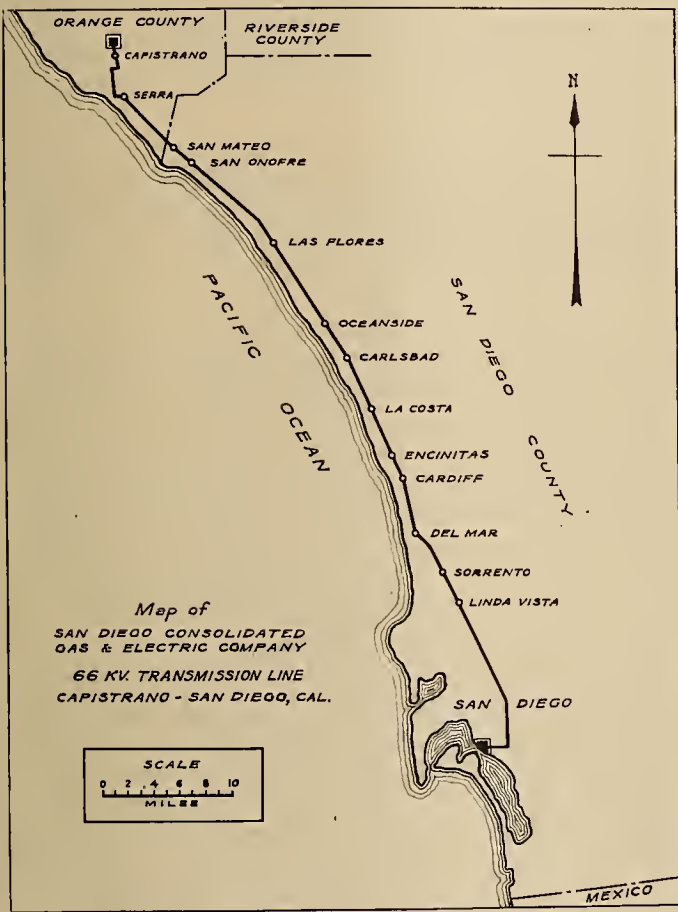
Camp Kearny, where the 40th Division of the new army is now being trained, comprises some 12,721 acres of land leased from the city of San Diego and a number of individual owners, at a nominal rental. The camp proper is 8,000 feet long by 3,000 feet wide, the quarters for the various units being built about a central drill ground as flat and level as a billiard table. Close by is the base hospital, of the separate unit type, provided with beds for 500 patients and equipped with absolutely the latest and best appliances known to science. Two miles away is the remount station, where about 10,000 horses are collected and trained before being shipped for service elsewhere. There is a post-office with several daily deliveries; a complete telephone exchange; a number of Y. M. C. A. and Knights of Columbus buildings; and a "Coney Island," which is being developed just outside the camp, where the men will find all sorts of wholesome amusement provided by concessionaires under strict military supervision.

Sanitation was of course the first thing to be thought of, and an idea of the task may be gathered from the following figures. Two distinct sewer systems, each discharging through a septic tank into a remote canyon, provide the necessary drainage for this city of 30,000 population. The camp proper required 39,000 feet of sewer pipe; the hospital 6,000 feet; and the remount station 4,000 feet. Practically every yard of these 49,000 feet of trenches had to be blasted out because of the nature of the ground, an impervious cemented gravel conglomerate formation.

Water is furnished by the city of San Diego, whose source of supply of pure mountain water is in a series of reservoirs some twenty to sixty miles away. A receiving reservoir at the camp, with a capacity of 1,762,000 gallons, distributes the supply to the mess kitchens, lavatories, etc., through some

fifteen miles of mains; ten miles in the camp, three miles for the remount station, and the balance for the hospital. The elevation of the reservoir is 523 feet above sea level.

There are four and one-half miles of paved streets in the camp, the paving being 20 feet wide and from 5 to 8 inches thick; and in addition to these, there are over nine miles of new roads on the cantonment, 26 feet wide and surfaced with disintegrated granite. The Santa Fe Railway has run a branch line from Linda Vista to the heart of the camp, a distance of two miles,



THE POWER LINE WHICH SERVES THE CAMP
Linda Vista was located in the desert, with not even a power line extending to it, no longer ago than last August.

and built a very large and commodious station, whence a regular train service is maintained—with enormous business, needless to say, in carrying the “liberty” men to and from San Diego.

The San Diego Consolidated Gas & Electric Company supplies Camp Kearny with light and heat. Just what this double installation means will be appreciated after a glance at some of the figures given below. To reach the camp an 11,000 volt line eight miles long was built to Linda Vista, requiring 111 poles 50 feet high; a branch line from Linda Vista to the camp, three and one-half miles long, requiring 55 poles 40 feet high; and (in order to guarantee continuous service) a tie line four and one-half miles long from the company’s La Jolla-Del Mar line. Nearly all pole holes had to be shot with dynamite. The total amount of copper in these three lines was approximately 34,000 pounds. At the camp there was erected a 600 kilowatt substation, stepping down from 11,000 to 2,300 volts, for local distribution. On the cantonment there are some thirteen miles of lines, requiring 876 poles; 951 service drops; 20,000 Mazda lamps for interior lighting; 404 100-candlepower street lights; a 200-horsepower pump at the camp proper; and a 100-horsepower “booster” pump on the pipe line connecting with the city mains. Every building and every one of the thousands of tents is supplied with electric light; and electrical power was a potent factor during the phenomenally fast construction of the camp.

The gas (with which all cooking is done) is supplied through a high pressure main thirteen and one-half miles long, and within the cantonment there are some ten miles of mains of smaller diameters. The maximum capacity of the 10-inch service main is 150,000 cubic feet per hour, and practically the entire line is welded together by the oxyacetylene process. Two Westinghouse positive oil meters, located at the southerly edge of the cantonment, will measure the supply of gas, which at present (December, 1917) is about 20,000,000 feet per month for the 300 services in the camp. Taking time by the forelock, the San Diego Consolidated Gas & Electric Company got its construction gangs into the field with such promptitude that by August 5th the gas in the mains reached the cantonment.

The climate of San Diego is so mild and equable that troops located here would have twelve months in the year for active out-door work uninterrupted by extremes of cold, heat, or stormy weather. This fact, together with the strategic importance of the location, at one corner of the national arena, has disposed the government to make this cantonment a permanent military base.



A CITY IN THE MAKING
The picture shows a Western camp in the process of construction. Kearny was one of the first camps ready, and has one of the cleanest records for health conditions.

POWDERED COAL FOR CENTRAL STATION USE

BY W. J. SANTMYER

(The shortage of fuel is making necessary the utilization of lower grades of coal, as well as the more efficient consumption of the coal now in use. A series of experiments carried on by a Puget Sound power company indicates that the use of powdered coal meets both these needs. The author, who is on the engineering staff of the Puget Sound Traction, Light & Power Company, has recently spoken on this subject before the lumbermen of the Northwest.—The Editor.)

The present fuel situation is such as to require the closest attention in order that there be no interference with industrial or domestic demands. Fuel oil has reached a prohibitive price, and even at that is practically unobtainable. This condition has resulted in a greatly increased demand for coal, which will probably tax both the mines and transportation facilities to their utmost capacities.

There are two ways of meeting this situation: by utilizing grades of coal previously wasted; and by getting higher efficiency from the coal burned.

As previous experiments and experiences indicated the feasibility of burning pulverized coal, that method presents itself as a possible solution. The theory of combustion strongly supports this plan. With powdered coal, it is possible to obtain an even, thorough and intimate mixture with air which results in a minimum of excess air and complete combustion.

It was about the first of 1917 that a series of experiments were begun in burning powdered coal in a 300 h. p. Babcock and Wilcox boiler in the Western Avenue station of the Puget Sound Traction, Light & Power Company, which were in intermittent progress some seven months. The results warranted the purchase of pulverizing mill, dryer, and all other equipment necessary for the complete installation of powdered coal plant for 2400 h. p. of boilers.

Before discussing the results of these experiments, I will outline the steps in the preparation of the coal. If not already to size, the coal is crushed to three-quarters inch and then fed into the dryer. The degree of dryness required to prevent any cohesion of the particles which would interfere with pulverization varies from 1 to 6 per cent, according to the form in which the moisture occurs in the coal.

Likewise, the fineness necessary to allow complete combustion while the fuel is still suspended is somewhat dependent on the character of the coal. With our lignites and sub-bituminous coals, which have a high volatile content and high fusing point of the ash, a less fine degree of pulverization is permissible than with coals having a greater proportion of fixed carbon. To get the best results our local coal should be ground up so that 95 per cent will pass through a 100-mesh screen and 85 per cent through a 200-mesh. However, we got good results with considerably coarser coal.

There is a rather prevalent opinion that powdered coal is extremely dangerous to handle, but experience has clearly proven that with reasonable precaution there is no likelihood of explosion or spontaneous combustion.

To transport the pulverized coal from Briquetville to Seattle, a box car was equipped with metal lined hopper so as to be air-tight and prevent the ab-

sorption of moisture. The coal was discharged into an enclosed conveyor which elevated and dumped it into the bunker. From the bottom of the bunker the coal was fed into the supply pipes by two motor-driven screws. The bunker being about 30 feet from the boiler front, the coal was conveyed this distance by compressed air.

Bearing in mind that the requirements of an ideal burner are to give a thorough mixture of coal and air with the minimum discharge velocity that will keep the fuel suspended until completely burned, I devised a burner which, by repeated test, has proven satisfactory.

As it is necessary to have sufficient space in the furnace for the combustion to take place without contact with the boiler tubes and to avoid the blasting effect of the flame impinging on the brick work, an extended oven, commonly called a "Dutch" oven, was provided. With some installations, the tendency of certain coals to slag has proven very troublesome, but in our case that feature was handled most satisfactorily by means of a slag pit beneath the furnace, constructed so that the slag cannot cling to the sides.

Coal Tested

The temporary equipment has been for the most part removed to make way for the permanent plant, but record has been preserved of many of the test runs in which representative kinds of coal were burned. Among these coals were: Black Diamond, South Prairie, Newcastle, including samples from screenings which had been 10 to 15 years under water in Lake Washington; Tono, which runs only approximately 8000 b. t. u. per pound; Renton, including sludge off the dump which in raw state analyzed over 21 per cent ash and 30 per cent moisture; and samples from California and British Columbia.

A Representative Test

In the following, I am giving a record in brief of a representative test:

Test of 300 H. P. B. & W. Boiler Burning Powdered Coal
Western Avenue Station, May 9, 1917

	Total or Average
Duration of trial.....	14 hrs. 38 min.
Water by Venturi meter.....	169,500 lbs.
Temperature of water.....	186° F.
Water evaporated, actual.....	166,960 lbs.
Temperature of steam (209° C.).....	408° F.
Steam pressure, gauge.....	116 lbs.
Temperature due to pressure.....	347° F.
Superheat.....	61° F.
Factor of evaporation.....	1.1
Weight of coal.....	21,820 lbs.
Evaporation per lb. of coal—	
As fired.....	7.64 lbs.
From and at 212° F.....	8.42 lbs.
Draft in uptake in inches of water.....	.27
Draft in mixing chamber.....	.208
CO ₂ by recorder.....	13½ per cent
Boiler horsepower.....	415
Flue gas temperature by pyrometer.....	475° F.
B. T. U. per lb. of coal, raw.....	9449
B. T. U. per lb. of coal, powdered as fired.....	10,967
Efficiency.....	75 per cent
Kind of coal.....	Renton Buckwheat

Coal Analysis

	Raw	Drier	Powdered
Water	15.20	7.11	5.44
Volatile	39.14	42.68	45.32
Fixed Carbon	32.10	37.32	35.57
Ash	13.56	12.89	13.67
	100.00	100.00	100.00
Sulphur . . . . .	.37	.42	.39
B. T. U.	9,449	10,862	10,967

Results of Tests

The results of our series of tests with powdered coal may be summed up in brief as follows:

It was found that different kinds and grades of coal could be prepared, transported, stored and burned with the same equipment, without physical difficulty.

That low-grade coals that cannot be burned efficiently in any other manner gave good results in the powdered form.

That higher efficiency was obtained than with any other means of combustion.

That the powdered coal fire proved remarkably flexible, it being possible to force the boiler to 200 per cent of rating in a few minutes without any apparent injury to heating surface or brick work.

That it was easy to operate, requiring but little attention, and thoroughly dependable.

That the fire was smokeless even under heavy overload.

That the increased capacity of boilers with pulverized fuel means less investment and hence a saving through lower fixed charges additional to that due to greater efficiency.

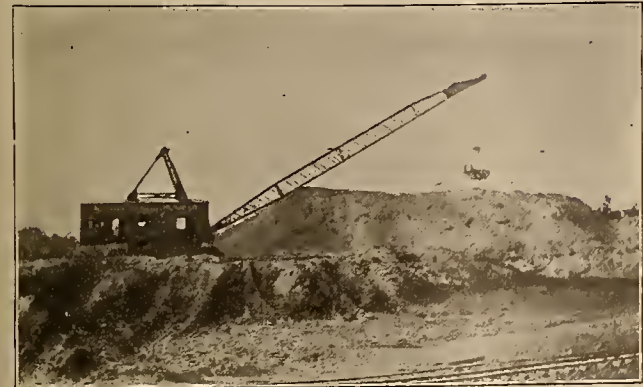
Cost of Preparation

While our experience with powdered coal is yet too limited to speak authoritatively on the expense of preparation, the cost would probably be from 30 to 60 cents a ton, depending on the quantity handled at the plant. At this figure you can see there would be considerable differential favoring pulverized fuel. In working out the equivalent costs of various fuels for any special case, careful consideration should be given the advantages previously mentioned.

ELECTRIC CONTROL OF DRAG LINE EXCAVATOR

BY. L. W. NICKEL

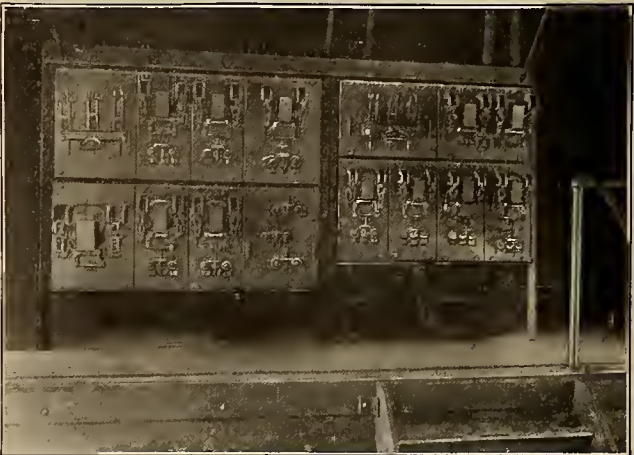
One of the most interesting applications of electric control in a field where reliability is essential can be found in the electric control of a drag line exca-



The excavator at work

vator used for stripping coal beds. The rock is drilled by steam drills and shot when encountered in the strip-

ping process. In one position with this drag line it is possible to take a cut of 150 feet wide. Spoil banks are always dropped on surface which does not contain coal, that is, the excavator is always placed directly over the vein and followed by a steam or electric shovel. The drag line method of stripping coal beds has found favor with mining engineers, inasmuch as it is much cleaner than any other method, as no rock or dirt can be spilled on coal when once cleaned, as is the case when it is necessary to run locomotive track for hauling rock and dirt which is taken off the surface.



Central panels for the electric drag line excavator

Electric control of a drag line is preferred because no fireman is needed, no coal passer and no pipe man. Further, there is no water pipe to freeze up, and on the coldest mornings no delay is necessary to start the stripping operation, it merely being necessary to close the main line switch and start operation.

This drag line excavator has a 24-foot diameter turn-table, 150 horsepower hoist motor, and 75 horsepower swing motor. The swinging machinery is operated by a 75 horsepower, 440-volt, type slip ring motor, driving a vertical swinging shaft by means of three gear reductions. A pinion on the vertical shaft engages the swinging rack on the base.

The main machinery is driven by a direct-geared 150 horsepower, 440-volt, slip ring type motor, operating at a speed of 565 R. P. M., and includes two drums, one of which winds the rope by means of which the bucket is dragged through the dirt, and the other operates the rope by means of which the bucket is hoisted. There is also a small drum for the purpose of manipulating the rope by means of which the boom is lowered and raised. The master controllers, brake levers, etc., are all mounted at the front of the machine facing the boom, at which point the operator can operate the machine without danger to the pitman.

The power for this installation when brought to the drag line system, is three-phase, 440 volts, 60 cycle. The current is commutated to the machine by means of a collector ring equipment consisting of three copper rings mounted concentric with the center casing of machine, which revolve with the same. Heavy brass brushes are anchored on the machine, to which the cable is attached, there being two brushes for each phase. The control of this drag line excavator illustrates the tendency, on the part of mining operators, to adopt electric driven machinery.

SHORT JOURNEYS IN PACIFIC LANDS

(Traveling in the Orient sounds to the uninitiated as though it might prove a precarious adventure—but in reality it means only traveling in somewhat greater luxury than that to which one is accustomed at home. With the developing trade between the West and the Orient, a knowledge of hotels and stopping places in Japan and China will prove most useful to the electrical man who looks to the frontiers for expansion.—The Editor.)

HOTEL ACCOMMODATIONS IN JAPAN

The Interesting Miyako Hotel at Kyoto

A few hours' journey by rail from Osaka brings one to the fascinating city of Kyoto, where so much of the manufacturing work in embroideries, vases, tableware, and the like, are brought to life. Here is to be found the most interesting and fascinating hostelry in Japan—the Miyako Hotel. Its location is fully three-quarters of an hour's ride by rickshaw from the station, but one is amply repaid for the journey.

Situated on a hillside overlooking the city of Kyoto, the Miyako Hotel commands at once a posi-



In the garden of the Miyako Hotel at Kyoto

tion from which one may acquire an enlarged viewpoint of Japanese life and civilization. The building, built after Japanese architectural design, rambles for some distance along the hillside, thus offering for every room occupant equal advantages for outside air and view. The dining service is charming. Daintily attired in the artistic Japanese costume, the little girl waitresses trip back and forth to serve the guests with truly Japanese art.

As one enters the long, glassed-in dining room which overlooks the city of Kyoto, the artistic arrangement of the flowers—the fragrant iris, carnation, chrysanthemum, or other grouping of flowers such as is known only to the Japanese artist—catches the eye. The rolling of the napkins, standing upright in each glass upon the table, seems, too, to harmonize wonderfully with the art expressed in the arrangement of the flowers. With such restful surroundings, it is not to be wondered at that the tourist is able to study the processes of manufacture of silks, cloisonne, damasene and other ware with an interest not aroused at any other Japanese city.

The Imperial Hotel of Tokyo

After a delightful overland trip of a day from Miyako one arrives in Tokyo. Tokyo is indeed a fitting climax to a tour of Japan. With what childhood

fancy we all have long thought of the home of the Mikado—descendant of the Son of Heaven! The Imperial Hotel, dignified and elegant, is indeed a worthy tribute to the might and power of a nation that has risen to such world eminence in a brief fifty years.

In one hallway leading from the main lobby is displayed in an attractive and dignified manner, by means of glass show cases, the acme of Japanese perfection in silk embroideries, culture pearls, vases, and indeed all of the principal things that have meant so much to Japanese industrial and manufacturing development. The main lobby, on the other hand, is de-



The Imperial Hotel at Tokyo, showing the attractive red and white bordered tag, the stationery and a typical menu

voted to luxurious furnishings for chats by business men in groupings or for afternoon and evening tea service.

The dining room service, too, is superb. The individual tables have upon them basket-work to hold flowers and unique bowls for jam and other preserves that give a distinct tinge to the leading hostelries of the Capital City.

And so it is that when the American tourist or engineer starts again for his homeward-bound journey he places among the fondest jottings of memory's dearest treasures the recollections of life and activity in the unique and enterprising hostelries of the Far East.

ELECTRICITY IN THE PHILIPPINES

Most of the industries in the islands are using electric current for lighting or power, or both, which has secured greater production and has contributed in a marked degree to the general prosperity of the islands. There are at present two hydro-electric power plants in operation.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(Allowance for depreciation is at best an approximation and is the occasion for endless confusion and complication in the fixing of the rate-base for public utilities. The shortcomings of the generally accepted formulas for such determination are here pointed out in contrast to the more accurate "Unlimited Life Method" by which replacements are treated as though they were repairs on a large scale. The author is a well-known consulting engineer of San Francisco, and an authority on valuation problems. —The Editor.)

THE DEPRECIATION PROBLEM

In an earlier article of this series something has already been said about depreciation and the replacement requirement and about the consideration that should be given thereto when earnings are to be limited by regulation. It has been stated by the author that it is fundamentally sound in principle and is good practice to regard the public utility as an institution or enterprise which has unlimited life (except, of course, in the special case where peculiar circumstances fix a life term) and that so regarded, all necessity for estimating accrued depreciation or the present worth of elements of limited life when rates are to be fixed falls away. This does not mean that maintenance and upkeep may be neglected. On the contrary, adequate provision must always be made to meet repairs and replacements regardless of whether the article which is repaired, perhaps by replacement of some of its parts, is one with a life of a few months only or is ordinarily expected to serve for some years. The principle is always the same. Such things as machinery begin to wear out or to deteriorate from the day they go into use. In the case of such things their present value can be estimated whenever a comparison is possible between the probable life of a new article of the same kind whose cost is known and the probable remaining life of the article whose present or remaining value is to be estimated. This fact makes it possible to estimate accrued depreciation in all cases in which past experience justifies a forecast of probable life new, and probable remaining years of service. But this depreciation in value in no way affects the quality of the commodity which is furnished by the utility nor the quality of service rendered, as the case may be. It is of no aid to the rate regulating authority to know exactly or even approximately what the accrued depreciation is, provided always that the plant in question has not been neglected, that it has been kept in proper condition, that there is no deferred maintenance, and that the service rendered by it is at full efficiency determined by the standard established by the plant itself. In most cases, despite the lessening intrinsic worth of some or all of the elements which make up a utility plant, its service will improve with age. The public acquires confidence; the reliability of and dependability upon the service to be rendered is on a higher plane with an old plant than with a new one.

Needless though it is to take accrued depreciation into consideration when earnings are to be limited by regulation, the requirement under the interpretation of the law by the highest court of our country that the starting point must be fair present value, compels its consideration, because, without such consideration the present value of depreciating elements can not be determined.

Accrued depreciation can only be determined with accuracy when the remaining life is known. This is the rare or exceptional case, as when for some reason, as in the case of a mining camp, the time can be predicted when by reason of exhaustion of the ore-bodies, the camp must be abandoned. Ordinarily both the probable life new and the remaining life for any article in service which is to be valued must be estimated. It becomes a matter of opinion and results can only be approximate. Furthermore, every prediction will be based on probability of failure at some particular time in the future, because it is just as likely that the article will serve beyond that time as it is that the article will fail before that time. The statement has been made in an earlier paper of this series that every calculation based on such premises, even though probable life has been correctly estimated, must give results somewhat in error. The current annual depreciation thus estimated will be somewhat too small, while the present value as determined from the ordinary formulas will be somewhat greater than the actual value.

The mathematical demonstration of these shortcomings of the generally accepted formulas is as follows:

When the probable life of an article was n years when that article was new and its expectancy or probable remaining life is e years, at the time for which current depreciation is to be determined, the current annual depreciation for an original cost of \$100 would ordinarily be estimated by the following formula:

$$\text{Current annual depr.} = 100 \left[\frac{(1+i)^{n-e} - (1+i)^{n-e-1}}{(1+i)^n - 1} \right]$$

where i is the interest rate expressed decimally, thus .06 for six per cent.

Or in another simpler form:

$$\text{Current annual depr.} = 100 \left[\frac{i(1+i)^{n-e-1}}{(1+i)^n - 1} \right]$$

Call: $n - e = m$

then the formula may be written

$$\text{Current annual depr.} = 100 \left[\frac{i(1+i)^{m-1}}{(1+i)^n - 1} \right] \dots\dots(1)$$

Now suppose that there are two articles under consideration whose expectancy at the time for which the current depreciation is to be determined was e years, but of which one actually went out of use s years before the predicted term of its service and the other served for s years longer than had been predicted. If these facts had been known the current annual depreciation of these two articles would have been expressed as follows:

There would be

- $m_1 = m + s$ for the article failing early.
- $m_2 = m - s$ for the article failing late.

For the article failing early

$$\text{Cur. ann. depr.} = 100 \left[\frac{i(1+i)^{m+s-1}}{(1+i)^n - 1} \right]$$

For the article failing late

$$\text{Cur. ann. depr.} = 100 \left[\frac{i(1+i)^{m-s-1}}{(1+i)^n - 1} \right]$$

For both articles,

$$\text{Cur. ann. depr.} = 100i \left[\frac{(1+i)^{m+s-1} + (1+i)^{m-s-1}}{(1+i)^n - 1} \right] \dots (2)$$

But according to the ordinary method of introducing expectancy into the calculation the current annual depreciation of the two articles would be estimated from (1): For both articles

$$\text{Cur. ann. depr.} = 100i \left[\frac{2(1+i)^{m-1}}{(1+i)^n - 1} \right] \dots (3)$$

The current depreciation as correctly determined by equation (2) will always be larger than that found by the ordinary method equation (3) because:

$$(1+i)^{m+s-1} + (1+i)^{m-s-1} > 2(1+i)^{m-1}$$

In the case of the determination of present value if expectancy be made the basis of the calculation, as is the common practice, the formula for the present value of an article whose original cost was \$100 is as follows:

$$\text{Present value} = 100 \left[1 - \frac{(1+i)^{n-e-1}}{(1+i)^n - 1} \right] \dots (4)$$

Let consideration be again given to two similar articles, the probable life of each of which when new was n years and whose expectancy at the time when valued was e years, and whose history shows that one went out of use s years before its predicted date of failure while the second continued in use for the same number of years beyond this predicted date. These two articles may stand for any number of articles whose actual terms of service will, in part, fall short of and will in part extend beyond the original probable life term, which is the problem for any group of articles all of the same expectancy.

We have again

$m_1 = m + s$ for the article that fails first, and

$m_2 = m - s$ for the article that fails last.

From the above formula:

$$\text{Pres. val. of the first article} = 100 \left[1 - \frac{(1+i)^{m+s-1}}{(1+i)^n - 1} \right]$$

$$\text{Pres. val. of the second article} = 100 \left[1 - \frac{(1+i)^{m-s-1}}{(1+i)^n - 1} \right]$$

Pres. val. of the two articles

$$= 100 \left[2 - \frac{(1+i)^{m+s} + (1+i)^{m-s} - 2}{(1+i)^n - 1} \right] \dots (5)$$

Determined on the basis of expectancy without regard to the fact that one-half of any number of articles must be expected to and probably will fail before, and the other half after the predicted date of failure, the present value of the two articles would be expressed by:

Pres. val. of both articles (ord. formula)

$$= 100 \left[2 - \frac{2(1+i)^{n-e} - 2}{(1+i)^n - 1} \right]$$

and because $n - e = m$

Pres. value of both articles (ord. formula)

$$= 100 \left[2 - \frac{2(1+i)^m - 2}{(1+i)^n - 1} \right] \dots (6)$$

$$\text{But } (1+i)^{m+s} + (1+i)^{m-s} > 2(1+i)^m$$

Consequently the formula (5) containing the larger negative term will always give results somewhat smaller than formula (6). By the use of expectancy and ordinary formulas, therefore, the present value would be estimated somewhat too large. Fortunately, the errors introduced by using the ordinary formulas based on sinking fund methods of calculation are not a matter of great importance because the basic elements to be taken into account, the probable life new and the expectancy after a period of service, are approximations based on expert judgment and may be at considerable variance with actual facts.

Here is an additional reason why value should not appear in the rate-base. But even though the necessity of computing accrued depreciation and present value, falls away when rates are to be fixed, the other problem of estimating the replacement requirement is ever present. The replacement requirement is often, though loosely, referred to as offsetting current depreciation. The allowance in the earnings is then referred to as an allowance for depreciation. This allowance thereby assumes the aspect of an amortization of capital to the extent that there has been lessening of worth and lends plausibility to the use of the remaining or present value of physical elements in the rate-base. That this is not necessary for correctly estimating proper earnings has been fully demonstrated by the author in "Valuation, Depreciation and the Rate-Base," and in various papers contributed to the Transactions of the American Society of Civil Engineers and the demonstration need not be repeated here. It is only necessary to say that any money accumulating in a fund for replacements should be regarded as being at the disposal of the utility owner for any purpose and that, theoretically, in so far as the ultimate result is concerned, it would make no difference whether the owner is allowed an interest return on present value plus so-called current depreciation estimated from remaining value and remaining life or whether he is allowed interest on full value new (original investment) plus the replacement or depreciation increment which will in the life term provide the funds necessary for replacement, provided always that the life term of any article in question could be known in advance.

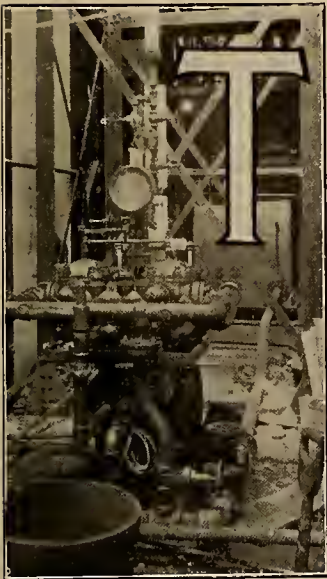
Consideration of this fundamental truth, coupled with the fact that accrued depreciation is not susceptible of precise determination, has led the author to recommend for general application the procedure which he has named the "Unlimited Life Method of Procedure," under which a clear distinction is made between value and rate-base and under which provision for replacements is to be made as required, being treated as though replacements were repairs on a large scale, to be foreseen before the necessity arises to make them, and under which therefore the earnings should be ample to provide a fund out of which either to meet the replacement requirements or to reimburse the owner after they have been made.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The accurate weighing of water and oil in oil-fired boiler tests is a matter of the greatest importance. The authors, at the invitation of the Power Test Committee of the American Society of Mechanical Engineers, presented their views on this subject before a recent hearing of the committee in New York City held for the consideration of the establishment of a code for the standardization of such tests. Further discussion in these columns by engineers of the West will be welcomed. In this article many other details are set forth, which are being embodied in a book on fuel oil and steam engineering by the authors. This book is now in course of publication and will appear for the trade about April 1, 1918.—The Editor.)

WEIGHING THE WATER AND OIL IN BOILER TESTS



Tank in rear for weighing oil the volumetric clearance of a steam engine, wherein water is poured into the cylinder ports when the p'ston head is at its dead end and the water afterwards drained out and weighed. From the weight of the water so used the volume of the clearance is computed. In rough measurements of engine and boiler performance the water is sometimes measured by filling a tank or barrel of known volumetric proportions, and by keeping account of the number of barrels so filled and dumped into the sump, sufficient data is obtained to compute the weight.

The Method of Standardized Platform Scales.—It is now universally recognized, however, that carefully weighing the water on carefully standardized scales is the only safe and reliable method of ascertaining the water fed to a boiler under test.

Let us then see how the details are arranged for the weighing of the water used in steam generation.

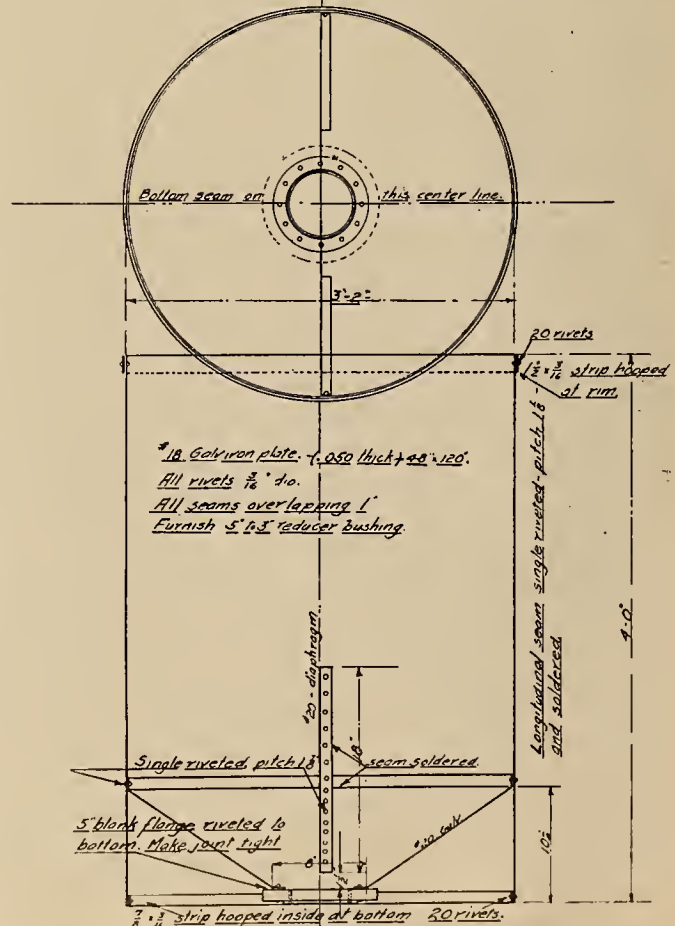
A large square metallic tank about 5 by 5 by 4 feet in dimensions is usually constructed. From the bottom of this tank all feed water for steam generation in the boiler under test is drawn. At the beginning of the test the water level in this tank is accurately measured by means of a hook gage situated within the tank. At the end of each hourly period of the test and at the conclusion of the test this exact level is also maintained.

The control for the water supply is accomplished by two or three vertical cylindrical tanks that have

a conically shaped outlet at the bottom. These tanks are located on standardized scales immediately above the main supply tank that has just been described. The complete installation is shown in the illustration. At the beginning of the test the height of the water in the boiler is noted on the gage glass in front of the boiler and as near as is possible the feed pump is regulated in its operation so as to maintain this level. At the instant of conclusion the water level is most carefully adjusted to meet the condition of boiler water level prevailing at the beginning of the test.

As the water is drawn from the feed tank beneath the platform scales the operators fill the tanks on the scales above and note the weight before and after emptying their contents into the tank below. Thus with ease the water surface in the tank below may be kept at the constant hook gage reading desired, and the net weight of water fed to the boiler ascertained at any time during the test.

The improvised desk boards shown in the illustration assist materially in aiding the water weighing



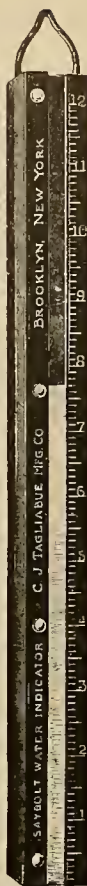
An Excellent Design for a Measuring Tank

**COMBINATION OIL SAMPLER**

Samples may be taken at any desired distance from the top by attaching a tape measure, and from the bottom, at a distance of from 1 to 15 inches, by means of a sectional rod which accompanies each instrument; merely screw on rod section of same length as distance from bottom where sample is to be obtained. On the central rod of instrument is fastened a delicate thermometer, so that the temperature of liquid may be obtained at the time of taking sample from container.

WATER INDICATOR AND OIL SAMPLER

This is an instrument for accurately measuring the depth of water that may settle in the bottom of an oil tank, and for drawing a sample of oil or water therefrom. It consists of a square metal tube 12 inches long, with heavy bottom. A scale, fastened to one side by screws, is divided in inches and tenths of inches. Upon the opposite side, and running its whole length, is an adjustable strip of metal controlled by a set of screws, to hold fast the strip of prepared paper, whose function is to show the water depth by having its colored surface removed and made white on that portion coming in contact with oil only not being affected.



operators to perform their task with ease and without confusion.

In order to prevent wastes and leakages of water, it is well to disconnect the outlets from the blowoff pipes of the boiler during the period of the test. All outlets from the water columns and gage glasses should also be carefully watched.

The Weighing of the Oil.—For the careful weighing of the oil fed to the furnace a similar device is constructed as in the case of the water determination. A metallic tank is constructed from which the oil supply is pumped to the furnace through the oil heater. The oil pump is best fitted with a governor and an automatic relief valve. By this means a constant pressure may be maintained on the oil line to the burners. The discharge from the relief valve is led back to the tank from which the supply to the pump is taken. Within the tank is situated a hook gage, the reading of which is carefully ascertained at the instant of the beginning of the test. This exact reading is maintained throughout the hourly progress of the test, and indeed at any other period if so desired.

This is accomplished by means of a tank situated above the main supply tank. This tank is installed on standardized scales. Previous to the discharge of the oil into the tank below, the scales are read and when the oil is brought to the proper hook gage reading in the tank below, the scales are again read. By subtracting these two readings, the net oil supply is ascertained.

Sampling the Oil Supply.—As the fuel is poured into the tank upon the standardized scales, a dipperful of the oil is set aside in a convenient receptacle. After a sample has thus been obtained from each tank, as it is weighed, the entire quantity is then thoroughly

mixed. Three parts of this mixture are then put into separate cans and sealed. One part is analyzed by the party or company for whom the test is being performed, the second is analyzed by a disinterested party, and the third is retained in case of disagreement.

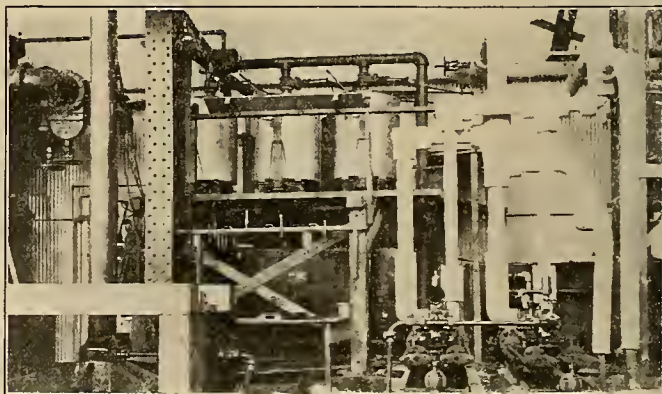
General Sampling of Fuel Oil for Purchase.—The question of determining a proper sample for commercial valuation of oil is one of patient care. The United States Bureau of Mines has evolved careful instructions to accomplish this in their technical paper No. 3, from which the following is largely an excerpt:

The accuracy of the sampling and, in turn, the value of the analysis must necessarily depend on the integrity, alertness and ability of the person who does the sampling. No matter how honest the sampler may be, if he lacks alertness and sampling ability, he may easily make errors that will vitiate all subsequent work and render the results of tests and analyses utterly misleading. A sampler must be always on the alert for sand, water and foreign matter. He should note any circumstances that appear suspicious, and should submit a critical report on them, together with samples of the questioned oil.

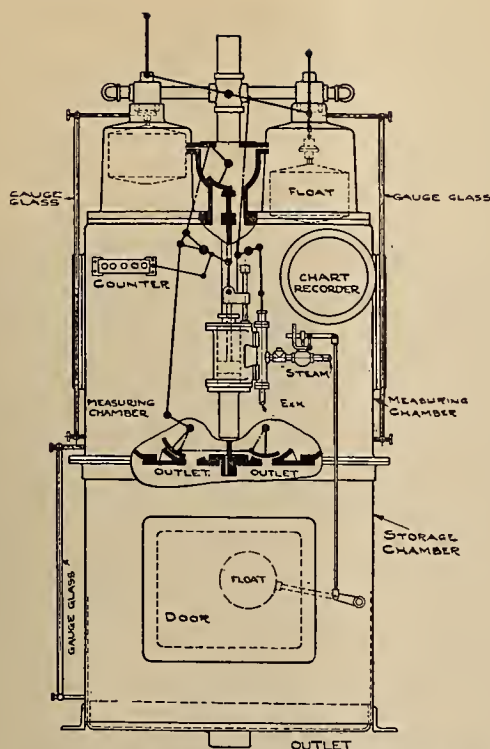
Sampling With a Dipper.—Immediately after the oil begins to flow from the wagon to the receiving tank, a small dipper holding any definite quantity, say 0.5 liter (about 1 pint), is filled from the stream of oil. Similar samples are taken at equal intervals of time from the beginning to the end of the flow—a dozen or more dipperfuls in all. These samples are poured into a clean drum and well shaken. If the oil is heavy, the dipperfuls of oil may be poured into a clean pail, and thoroughly stirred. For a complete analysis the final sample should contain at least 4 liters (about 1 gallon). This sample should be poured into a clean can, soldered tight and forwarded to the laboratory.

It is important that the dipper be filled with oil at uniform intervals of time, and that the dipper be always filled to the same level. The total quantity of oil taken should represent a definite quantity of oil delivered and the relation of the sample to the delivery should be always stated, for instance: "1-gallon sample representing 1 wagon-load of 20 barrels."

Continuous Sampling.—Instead of taking samples with a dipper, it may be more convenient to take a continuous sample. This may be taken by allowing the



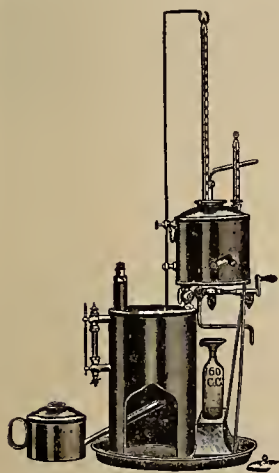
A DESIGN FOR A WEIGHING TANK IN A BOILER TEST
In order to assure the rapid passage of water or oil from the tank upon the platform scales into the container below, the employment of steel tanks with conical shaped bottoms is most effective. The outlet for the oil or water should be controlled by quick-opening valves.



AN EXCELLENT WATER MEASURER

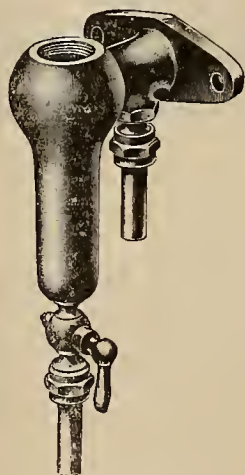
While the automatic water measurer is not as accurate as the standardized scale method, still it finds many applications in the testing laboratory.

oil to flow at a constant and uninterrupted rate from a $\frac{1}{2}$ -inch cock on the underside of the delivery pipe during the entire time of discharge. The continuous sample should be thoroughly mixed in a clean drum or pail, and at least 4 liters (about 1 gallon) of it forwarded for analysis. A careful examination should be made for water, and if the first dipperful shows water this dipperful should be thrown into the receiving tank and not mixed with the sample for analysis.



THE VISCOSIMETER

The design of this viscosimeter is based upon a thorough knowledge of lubricating oils and of the requirements of manufacture and trade. It is made to meet all demands as a measure of viscosity, and is without the many objections that may be made to all other devices for this purpose. The viscosity of any oil is shown by the number of seconds required for a certain number of cubic centimeters to run through the open faucet. This corresponds to the most generally approved standard now in use by the largest refiners.



LIQUID CIRCULATION POCKET

This device is used in connection with a thermometer for taking the temperature of a circulating liquid—such as water being pumped from the hot well to the heater or boiler; when the main line that carries the liquid is located rather inaccessibly. The pocket is located in a position most convenient for easy observation and, by means of the connections provided an auxiliary line is run to and from the main pipe line.

Mixed Samples.—The all-important point is that the gross sample, whatever the manner of sampling, shall be made up of equivalent portions of oil taken at regular intervals of time, so that the sample finally forwarded for analysis will truly represent the entire shipment.

Water or earthy matter settles on standing. Hence, before a large stationary tank or a reservoir is sampled, the character of the contents at the bottom should be ascertained by dredging with a long-handled dipper, and the contents of the dipper should be examined critically. If a considerable quantity of sediment is brought up, it should be cause for rejecting the oil.

BAGASSE AS A SOURCE OF FUEL

The use of bagasse, or megasse, as it is sometimes called, as a source of fuel, dates from the earliest periods of cane-sugar manufacture, according to E. C. Freeland, in a paper read before the recent annual meeting of the American Society of Mechanical Engineers.

Bagasse, chemically, consists mainly of a tough fiber, sugar or sucrose, glucose and other reducing sugars (by a reducing sugar is meant one that will reduce Fehling's solution), and water. The fiber content ranges from 30 to 50 per cent; the sucrose from an almost negligible quantity to as high as 10 per cent; and the water from 40 to 65 per cent; the other constituents occur in such small amounts that they may be disregarded.

It has been found that the average Louisiana bagasse has a calorific value of about 8300 B.t.u. per pound of dry bagasse and from 5620 B.t.u. gross (with bagasse containing 56.7 per cent moisture) to 4800 B.t.u. gross (containing 42.8 per cent moisture). The net heating values are respectively 2200 and 3350 B.t.u.

One pound of bagasse will evaporate from 2 to $3\frac{1}{2}$ lbs. of water "from and at 212 Fahr." Assuming coal and fuel oil to have, respectively, calorific values of 14,000 and 19,000 B.t.u. per lb., then from 4 to 6 lb. of bagasse are equivalent to 1 lb. of coal and from 43 to 65 lb. equivalent to 1 gal. (about 7.6 lb.) of oil.

In former years not much attention was paid to the drying of bagasse before burning it. It was the custom either to sun-dry it or to feed it to the furnaces in a wet condition, just as it came from the mills.

As to the economy of bagasse drying, many authorities claim that a great saving can be effected by drying this fuel before it is fed to the furnaces. This has been proved as a result of many experiments.

Professor Kerr says that in Louisiana 10 per cent of the total heat generated by the combustion of 1 lb. of bagasse is required to evaporate the moisture present. About $14\frac{1}{2}$ per cent of the moisture in Louisiana bagasse was removed by drying it, and the dried bagasse had a heating value 55 per cent greater than the wet bagasse. This means that a saving of over $2\frac{1}{2}$ gal. of oil will be effected per ton of cane ground. In a factory grinding 60,000 tons of cane per season this means a saving of about 164,000 gal. oil, or 3670 bbl., which, at \$1.25 per bbl., means a saving of \$4,587.50 per season.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

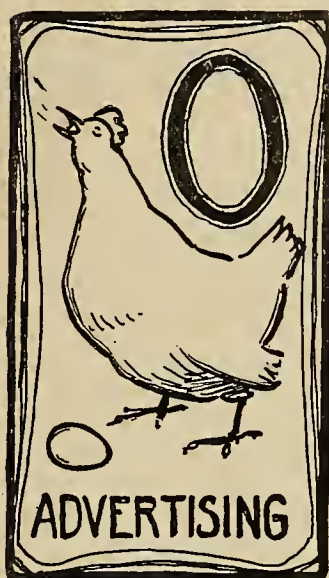
COST KEEPING

ESTIMATING

IMAGINATION IN ADVERTISING

BY H. A. LEMMON

(The advertisement which appeals to the good judgment of a purchaser will bring better results than the ad which bases its attractiveness upon low price only. The foundation builder for a business is the bargain measured by satisfaction and service. The author, who is sales manager with the Truckee River General Electric Company, of Reno, Nevada, has had many years of experience in the writing of advertisements.—The Editor.)



ONCE upon a time the merchants of a small city in northern California got into an egg war. One belligerent would no sooner grab his marking pot and produce a sign, "Eggs 40c," than his next-door rival would go him one better with: "Eggs 35c." One store kept out of the struggle. It displayed a nicely painted sign: "FRESH Eggs 45c," and backed it up with a dozen eggs washed and polished until their mothers would not have known them. The emphasis placed on the word "FRESH," by

implication at least, discredited the eggs of competitors. Quite likely this incident furnished the foundation for the favorite yarn of the merchant who placed two signs in his windows: "Eggs 30c; Fresh Eggs 35c," when as a matter of fact all his eggs were fresh and from the same case.

It is quite possible that that sign of the non-combatant Placerville merchant is one of the best advertisements ever written, while that of his competitors probably belongs to that type that is poorest.

One of the most precious gifts we have inherited from that Providence which also made the octopus and the butterfly, is imagination, but like most priceless gifts it is rare, and yet we who are endeavoring to sell electric appliances and devices must depend upon it almost exclusively to get us the wherewithal to buy Uncle Sam's new green trading stamps.

"Eggs 30c" is a statement that doesn't excite the beholder or his imagination to any appreciable degree. Many of us have encountered it without losing our presence of mind or suffering severe nervous shock. Its only appeal is based upon the assumption that the passer-by cannot be happy until he becomes owner of a number of eggs and that he knows the market is something above that figure.

A lot of us once thought price the great appeal. It was perfectly logical to our minds that we were in business to sell goods; that all we had to do was to price them low enough and someone was sure to buy. Having that sort of a mind, of course, we sold cheaper and made more sales than our competitor (or did we?) and kicked "overhead" out of the way as being an ornamental theory invented by some literary salesman who we believed never made an actual sale in his life. Most of us who did so believe, are now in other lines of business, or will be just as soon as our creditors make an investigation. Others scorned to consider price in making a sale. These are the "impractical" fellows who splash mud on us as they whirl around



The customer doesn't want poor eggs at a low price—she wants good eggs and will pay what she must to get them

the street corners, and whose prosperity we ascribe to "luck."

The fresh-egg advertisement is a paragon because it seems impossible to tell a complete story in fewer words. It haughtily refuses to appeal to the baser form of bargain instinct by holding out the bait of low price, or even by including the word "large," as descriptive of the eggs. It only uses the price because that price is very high, compared to others, and therefore it implies quality. The word "fresh," however, does stimulate the imagination in every manner possible to stimulate it—that is, if you are interested in eggs for eating purposes only.

Not that we should belittle the pull of "bargain instinct" in our advertising of electrical goods. On the contrary, 90 per cent of our sales will be made because we excite it; but we can use it in a more interest-compelling form.

Perhaps we can illustrate: A suit of clothes for \$20 is not, in itself, a bargain. A suit of clothes that

will last a year and continue to hold its shape and brightness is decidedly a bargain, even if it cost \$30. It is not offering a bargain to the ladies who read our ads to tender percolators for \$6, any more than it is to offer a suit of clothes for \$20. So we see that a genuine bargain—the kind we can safely adopt as a foundation builder for our business—is measured by



A cheap suit may be a good bargain—but on the other hand, it may be a very poor one. Your customer knows that as well as you do.

the degree of service we may obtain from ownership of the article or device, and not from the device itself. The first suit of clothes was merely a suit of clothes. The other represented a year of service and satisfaction—therefore a bargain.

The two suits may have appeared much the same in the store. We were fortunate in buying the higher priced one—not because it looked ten dollars better—but because the salesman excited our imagination by suggesting in more or less subtle manner the pleasure and satisfaction and service ownership would give us. If our imagination were not set in motion in some manner we never would pay \$30 for a suit when other suits might be had for \$20.

Again: When we feel the pressing need of a suit of clothes and enter a store, we may be shown the two mentioned above. Perhaps the cheaper one is more appealing to the eye than the \$30 one, and yet we select the latter. Why? The former appealed to the eye, but the more expensive one appealed to our imagination. If the salesman hadn't stimulated our imagination (or possibly the higher price itself did), we most certainly would have purchased the cheaper one.

LETTING THE CUSTOMER TALK is the moral of the story told by W. D. Kamm of the Great Western Power Company of Oakland, Calif., in a recent issue of "How-I-Did-It." Since the salesman's objective point is the securing of a signed contract from his prospect, there is only one way to judge his success as a salesman and that is by the number of bona fide contracts he secures.

Now, what stands in the way of the less successful salesman from equaling the exploits of his fellow craftsman? Obviously, he works along wrong lines. As the writer sees it, one of the most prevalent faults of the average salesman is his dogged determination not to let anybody out-talk him, and in his zeal to keep up his end of the conversation, he engages in a conversational marathon with his prospective customer that often ends in the exhaustion of both.

The object of the interview is lost in an argument on some irrelevant matter, but our garrulous salesman returns to the office and tells his superior that he had a long talk with "Mr. C.," although he neglects to state that both he and "Mr. C." carefully avoided any reference to the subject matter.

Let your prospect take the conversational bit in his teeth and run away if he pleases, but hold him in his course by timely references to the object of your visit. A little story of the writer's personal experience with one of these long-distance talkers might serve to illustrate the point:

Four of the five salesmen had tried to sign up "Mrs. J." and they had all failed. She had called up the office and complained of the impudence of two of them and the others had met her and come off with experience only. I heard the boys talking of their attempts to placate the "old lady." They all agreed that she was an "iron-jawed talking machine," and not any too particular what she said. They had all been routed and were through.

I thought to myself that I would take a chance with this ogress, so the next morning found me on her front porch, ringing the door bell. The door opened and there she stood.

"Good morning, 'Mrs. J.,'" I said in my most businesslike tones, at the same time handing her my card.

The old lady adjusted her spectacles, carefully read the card, and looked me over from head to foot. Then deliberately, like a strong man toying with a weight as he prepares to lift it, she rolled her tongue around, opened her mouth and started talking. "I suppose you have come out here to try to get me to sign up with your company," she snapped. "They would have had my business long ago if they did not have such impudent representatives in their employ. Why, do you know, 'Mr. Q.,'" and away she went.

I decided to simply hold her in her course and give her a free rein. Two hours afterward, and we had stood up at the door all this time, she suddenly stopped talking, looked at the tall clock in the hall and said, "My, I have almost forgotten Mr. J.'s lunch," and in the same breath, "Well, Mr. 'Q.,' you have talked me out of my business. I'll sign with you." I produced my contract blanks and pencil and as she signed she looked at me and said, "Can't you come out some night and meet my husband? I enjoyed your conversation so much."

And I can assure you that, aside from handing her my card, all I said to her was, "Good morning." I was too exhausted to say good-bye, and it is needless to say that I have not yet met her husband.

All of which happened four years ago and the old lady is still numbered among our satisfied customers.

Moral: He is best sold who sells himself.

Western Ideas

A **WRECKED WINDOW** is ordinarily placed to the debit side of the card ledger, but a clever electrical dealer turned it very quickly to the credit side of his business. An automobile, crashing into the store of Kohlwey-Smith-Alfs Electric Company of San



There was no "break" in the business of this enterprising store

Francisco, broke up one of the large plate-glass windows rather badly. Quick to see that the wreckage would gather curious crowds, the proprietor placed a sign, bright with red letters, "Our goods are so popular that they drive in to get them." In contrast to this bare, broken window, the one opposite was a bright and attractive display of the "so popular" wares.

Undoubtedly the expense of the breakage was more than refunded by the interested observation of pedestrians and the admiration excited by turning an unfortunate occurrence to good profit.

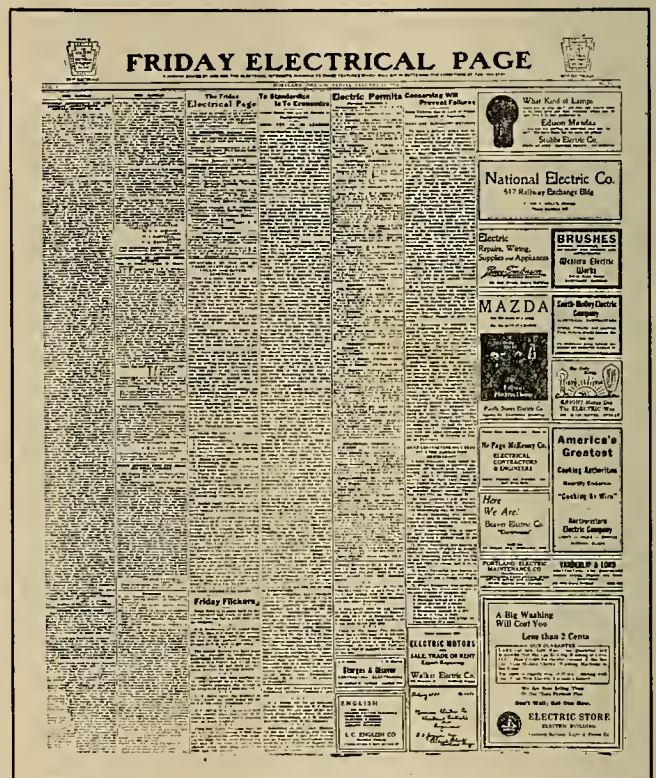
TAGGING THE MACHINES of the farmers who attend a state fair is an idea which has been worked out with considerable success. The automobiles and buggies which the farmers drive to the fair grounds are usually parked in a single enclosure. One exhibitor of electrical apparatus conceived the idea of tagging the machines with a notice of his exhibit and its location—and added for good measure some of the attractive literature with which he was furnished by the manufacturers.

This served a double purpose. It made certain that every visitor to the fair was introduced to the brands of electrical ware which he carried, and also brought many to the exhibit booth who otherwise might have passed it by unwittingly.

A similar idea was used by a dealer in a small town who "tagged" every machine which came into town. The tag is attractively gotten up with a picture of apparatus—the cut was furnished by the manufacturer—and with the name and address of the shop across the bottom. The owners of the machines not only knew that such an establishment was in existence, but they were impressed by the good taste and intelligence of this owner as expressed on this informal "calling card."

TO PREVENT YOUR WINDOWS FROST-ING, use an electric fan. In regions where the thermometer often drops below zero, the electrical dealer is frequently bothered by the frosting over of his windows. Obviously, a window display completely obscured behind a curtain of white, is of little use either to the owner of the store or to the customer who is interested in the electrical ware displayed. Although many ideas for the prevention of this condensation have been suggested, such as the inner ventilation of the window space, one of the simplest and most effective—and certainly the most appropriate for the dealer in electrical ware—is to place an electric fan to one side of the window. By directing the breeze against the glass the frost easily clears up.

THE FRIDAY ELECTRICAL PAGE has come to be a weekly institution in Portland, Oregon. A full page of The Daily Record-Abstract, a business newspaper of Portland, is cared for every Friday by the



Interesting to the layman as well as the contractor-dealer

Oregon Association of Electrical Contractors and Dealers. The slogan at the head of the page explains that it is devoted to "those features which will aid in bettering the conditions of the industry." Articles of interest to contractors and dealers are reproduced from the various electrical journals, and items of local interest form a "Friday Flickers" personal column. The page offers a splendid medium for advertising, and fully two columns are always devoted to contractor-dealer ads. Electrical permits granted and like information are given for the convenience of electrical readers. The page has come to be looked for and read by many who are not connected with the association, and besides serving as a society publication is an excellent advertisement to the general public of the fact that the electrical contractors and dealers are a wide-awake and progressive group.

BIG, LITTLE AND COLORED STICKERS, stamped with their trade-mark, have proved a successful business getter for Eardley Bros., electrical contractors and dealers of Salt Lake City. The most used are the little black and white ones. A ring of clearly printed and catchy phrasing surrounds the trade mark. The bright yellow and black seal attracts



A trade mark that sticks in the mind as well as on the merchandise

the eye at once. It differs from the smaller size by an outer ring in black and yellow checks, and a few words which give the business address and an idea of goods other than electrical which may be bought there.

These two stickers find their way to many unexpected places which can not be reached by other forms of advertising. Mail forms, photographs, books, etc., bear these seals, which serve not only as identification marks, but as business reminders. The larger seal, which is used in printed advertisements, is a combination of the two gummers plus an outer ring in bold type, "Make our store your shopping center," and undoubtedly this pleasant invitation finds many acceptances.

Stickers like these—bearing a trade slogan—lend themselves to a great variety of usage. For instance, the seals can be stuck at random on all materials—packages, wrapping paper, catalogues, etc. There is also an opportunity for change of color at different seasons of the year: Green and white is popular in commemoration of St. Patrick; red, white and blue come to the fore in July with the Fourth, and at Christmas time the vivid reds and greens would suggest that bright and useful gifts could be purchased at that particular electric store.

A BUREAU OF INFORMATION, fostered by electrical societies for the use of architects, was the suggestion made by H. C. Reid, president of the California Contractor-Dealers' Association, at a recent meeting of the San Francisco Electrical Development League.

The relation that the electrical man has had with the architects in the modernizing and beautifying of San Francisco's rebuilding period and San Francisco's exposition, points clearly to one conclusion, the necessity of still closer co-operative relationship.

In these days of rapid development of all things mechanical and electrical, a bureau of information at

the disposal of the architects, one that they could at all times turn to for information they desire, a bureau that would satisfy them with dependable, scientific and impartial advice on electrical matters, would be a natural function that a league of electrical men should perform.

The public approves or disapproves of things electrical according to the satisfaction it gets from the use of the articles utilizing electrical energy. Those factors which have contributed and which are primarily responsible for successful service are to a large measure unknown and unthought of. The foresight and the plans of the architect, the skill of the contractor handling the work, the unfailing service of the power company—each contributes its part to this satisfaction.

The Electrical Development League, Electrical Contractors and Dealers Association, and other similar organizations are each doing its part in our commercial development.

CARRYING A RED HOT STOVE used to be a joke in old-fashioned vaudeville shows, but it has added comfort to the chill of New York's fuel-less winter. The accompanying illustration shows a group of theatrical people in New York making use of small electric stoves while traveling on the surface cars. Of course, the idea is more or less a "publicity stunt," but it suggests possibilities to the wide-awake contractor-dealer. Little hand and foot warmers which contain a heated brick or a few coals, have long been known to sleigh riders—even as far back as grandmother's day—and there is no reason why the idea should not develop to its electrical conclusion, as have the tallow dip and the wood stove.



Better than a muff on heatless days

A simple, easily charged heater, such as the ones shown here, would find a variety of useful applications. There are any number of uses to which it might be put in the home, the fact that it is easily transported from place to place making it possible for it to fill a need similar to that of the electric flashlight for emergency lighting. Imagine what comfort such a heater might give to the traveler abroad, who too often must put up with chilly rooms and traveling compartments—or to the elderly lady who must visit in a home unprovided with adequate heating facilities.

THE MANUFACTURE OF ELECTRICAL APPLIANCES

BY M. H. MERTZ

(Every man handling electrical ware should know as much as possible about his product. If you can tell a customer how the appliance is made and the reason for its good points, he will come much nearer believing what you say in your recommendation. This interesting article tells of the assembling of electric irons and other household devices, at Ontario, California.—The Editor.)

The recent merger of three large manufacturers, viz.: the appliance department of the General Electric Company, the Hughes Electric Heating Company, and the Hotpoint Electric Heating Company, into a new corporation to be known as the Edison Electric Appliance Company, Inc., centers interest on one of the largest and certainly one of the most interesting phases of the electrical industry, viz.: the manufacture of household electrical appliances.

The promotion and sales work in the new corporation will be carried on by each of the three divisions as they were before consolidation. The general offices after January 1st will be moved from Ontario, California, and Pittsfield, Mass., to Chicago, and installed in the building now used by the Hughes Electric Heating Company, 5560 Taylor street.

Manufacture will be consolidated—recent addition of 30,000 feet of floor space in the Hughes factory enabling special machinery to be installed which is now in use in the General Electric factory at Pittsfield, Mass.

The Hotpoint division will operate its factories at Ontario, California, and at Chicago, as before. The Ontario factory covers several acres, and consists of several large one-story concrete buildings,

all of which are fireproof and thoroughly ventilated.

Good light, good ventilation and good treatment in general are absolutely necessary in a plant of this kind, as the work must be standardized on such a high plane that a perfect article can be placed on the market at a very low cost. Low cost is necessary that the buying public may become acquainted with and use these economical and efficient articles in their homes, which, although often seeming to be luxuries at first, soon justify themselves to the progressive housewife.

Quite a feature of the Ontario plant is the Hotpoint Club, with its electric cafeteria and grocery store, where the employees can obtain their meals and groceries at a very low cost. The aim of those in



ASSEMBLING A GRILL

The work is done in a systematic manner, similar to assembling an iron, each man having his particular part.



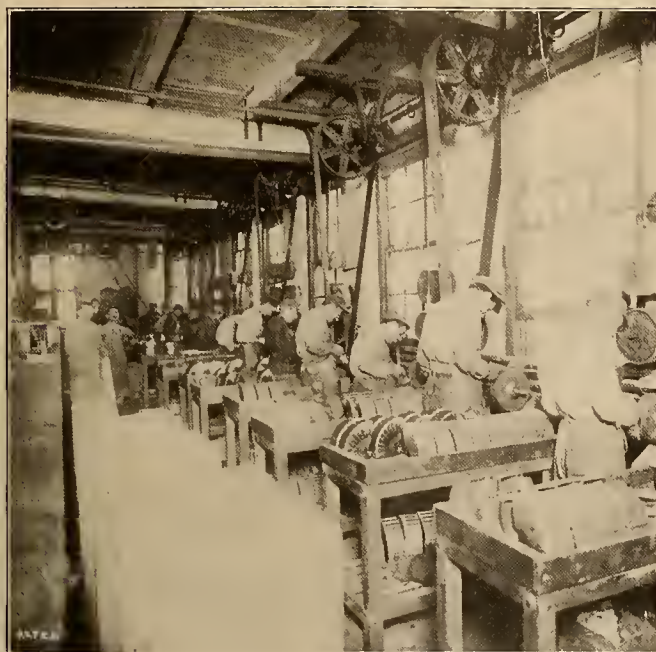
AN EXPORT SHIPMENT

Goods must be carefully packed and protected against dampness and sea water.

charge of the store and cafeteria is to give first-class service at a minimum cost, and it is chiefly through the generous patronage of these institutions that the various social and athletic activities of the club can be maintained.

These and other innovations are examples of what the company is doing for the benefit of its employees. It isn't philanthropy—merely common sense; an investment that pays large dividends, as every progressive factory manager knows.

There are about thirty-five parts to an electric flatiron, and the preparation of the various parts and their assembly is particularly interesting. After the parts have been plated, polished and tested, they are placed in receptacles on a long table and the irons assembled in batches of ten. Each workman has his designated task to do in the assembling, and the speed with which ten irons are completed is amazing. Considering that nearly 300 individuals handle the parts of the product and assist in the assembling, the de-



ASSEMBLING AN IRON

Parts of the iron are strung along the benches and assembled in lots of ten. Each workman has his particular part of the operation to do. The picture at the left shows the buffing of the sole and pressure plate of the irons. The plates are thoroughly cleaned in this manner before the chemical bath is applied and the plating is done.

gree of efficiency and economy of motion attained is remarkable.

The cleaning and plating of the various parts of an article are done in a separate department, said to be one of the best shops of its kind in the state. Each piece of iron, after buffing, is subjected to a vigorous washing process similar to that used in a laundry, but in this case powerful chemicals are used to make the parts absolutely clean.

The sole plate, or base, of the iron is an ordinary piece of iron drilled and tapped so as to fit into the other parts. Over this sole plate is placed the heating element, with the leading-in wires protruding at the back. Over this is placed a pressure plate, similar to the sole plate. These three, the sole plate, element, and pressure plate, over which the polished shell is placed, are fastened together by screws forming the body of the iron proper. The contact guard (into which the plug of the attachment cord fits) is fitted into the shell, and into this in turn is placed the handle uprights, and the whole is fastened by two screws. The wooden handle is placed between the uprights and held by little sharp points of metal protruding from the uprights. One screw is inserted in each end of the handle, fastening it firmly into place. The iron is now complete—everything is made to fit, and fit it does.

Each iron, after completion, is given a "breakdown test" of 600 to 900 volts to locate and electrical weakness or faults. As 220 volts is the maximum service voltage used to operate an iron, this breakdown test is very adequate.

The construction of the heating element is a particularly fine piece of work. Two strips of white mica are wound separately with nickel chrome wire, but the winding is continuous, the same piece of wire being used for both strips. The winding, done by machinery, is a very delicate operation. Two pieces of mica the shape of the ironing surface, are placed above and

below the wound core and the whole fastened firmly together.

A very prominent feature of the iron manufactured by the Hotpoint Electric Heating Company is its "hot point." By winding the resistance wire closer at the tip, more heat is generated per square inch of ironing surface at the point, with a graduated reduction toward the back of the iron.

Attachment cords for the irons and other utensils are cut to length, the ends trimmed and cleaned, and the socket and plug attached. The cutting, trimming and cleaning is done by machinery, the rest by hand. This preparation of cords is done by a force of women in a separate department.

The process of cleaning, plating, polishing, assembling and testing of every article made by this company is practically the same as for the iron.

LLOYDS' REGISTER OF SHIPPING—USE OF ELECTRIC LIGHT ON VESSELS

(The impetus given to shipbuilding by the demands of war has had its correlative effect in the electrical industry. A knowledge of the rulings under which ship wiring must be done is imperative to the electrical contractor. The majority of ships built for the Allies, as well as many American vessels, follow Lloyds' rulings, a portion of which code was given in an earlier issue. This article completes the series.—The Editor.)

Distribution

1. The main switchboard should, if possible, be fitted in the dynamo room, to which all main circuits throughout the ship should be brought, a switch and fuse being fitted thereon for each circuit. The distribution boards for further sub-division of the current should be placed in conveniently accessible positions, and each such switchboard should be similarly fitted with a separate switch and fuse for each sub-circuit. Fuses should be fitted to each lamp circuit where these are made with reduced size of wire. If vessels are

wired on the double-wire system, fuses should be fitted to each cable of each circuit.

2. In cases where electric lights are used for the mast-head light and side lights, the switches controlling these lights should be placed in a position where they can be controlled by the officer of the watch, or other responsible person, and cannot be tampered with by other members of the crew, or by passengers, etc.

3. The switchboards should be of slate or other incombustible non-conducting and moisture-proof material. The switches should be on the quick-break principle, and should be so constructed that they must be either full "on" or completely "off"; that is, they must not be able to remain in an intermediate position. They should have ample rubbing surfaces, and their conductivity should not be less than that of the wires connected to them, and they must be incapable of forming a permanent arc when breaking circuit.

4. Fuses should be fitted to each main or auxiliary circuit, on the switchboards, as near as possible to the switches of these circuits. If the switchboard is not fitted near the dynamo, or if more than one dynamo may be used on any one circuit, then fuses should also be fitted to the main cable as near as possible to each of the dynamo terminals.

5. All fuses should be fitted in easily accessible places, and as near as possible to the commencement of the cables or wires they protect. They should be mounted on slate or other incombustible bases and be arranged so that the fused metal may not be a source of danger, and where they are fitted with covers these should be incombustible.

6. All fuses should be of easily fusible and non-oxidizable metal, and should be so proportioned as to melt with a current 100 per cent in excess of that which the cables they protect are capable of carrying as shown in Table 1. The terminals must be so spaced apart or screened that an arc cannot be maintained when the fuse is blown. Separate single fuses and not "double-pole" fuses must be used on circuits where the pressure exceeds 125 volts.

7. The fuses for each cable should be made of standard dimensions, so that a large fuse cannot be used for a small cable by mistake; or, if wire fuses are used, permanent instructions should be fitted on or near each switchboard giving particulars of the proper size of fuse for each circuit.

8. In shaft passages and in damp places, all lamp switches and fuses should be of strong water-tight patterns, or should be placed in water-tight boxes having hinged or portable water-tight covers. No switches or fuses are to be placed in bunkers.

9. There should be no joints in the cables leading from the dynamo to the main switchboard, nor in those leading from the main to auxiliary switchboards, nor should branches to single lamps be taken off these cables.

10. A voltmeter should be supplied with each installation. If more than one dynamo is fitted, neither being capable of the whole of the output, an ampere meter should be supplied with each dynamo, unless each dynamo is protected by extra sensitive fuses.

Joists With Hull

1. In vessels fitted on the single-wire system, all the joints with the hull should be placed in accessible

positions. Those for single lamps or for small cables should be made with brass screws not less than three-eighths of an inch in diameter, carefully tapped into the iron or steel, having white brass washers, between the wires and the vessel, or the wires should be soldered to brass-faced washers. For larger cables above 7/18 S. W. G., and for the pole of dynamo the cable wires should be properly sweated into brass or copper shoes, which should be bolted to the vessel. The iron or steel, where contact is made, should be filed bright, and the area of contact should not be less than eight times the section of the copper of the cable.

In Vessels Carrying Petroleum

1. The single-wire system must not be adopted for any part of the installation. Switches and fuses must not be fitted in places liable to the accumulation of petroleum vapor or gas, and all lamps in places where it is possible for gas to accumulate must, with their holders, be enclosed in air-tight fittings of thick glass. All wires in such places are to be lead-covered, or the insulation of the cables employed is to be of such a nature as not to be affected by petroleum. No joints of cables, switches, or fuses should be fitted in the pump-room, but the wires for each lamp therein should be carried to the lamp from a distributing junction box placed outside the pump room or companion.

(The following paragraphs referring to the effect of the electric light installations upon the compasses are issued as suggestions, not as rules.)

Position of Dynamos and of Electric Motors

1. The position and type of dynamos and electric motors should be such that the compasses will not be affected.

Cables

2. In vessels fitted with continuous current dynamos, and wired on the single-wire system, no single cable should be carried within 30 feet of any compass, and cables conveying heavy currents should be fixed at still greater distance. If it is necessary to fix any cables within this distance, then for all parts of the vessel lighted from this cable the concentric or double-wire system should be adopted, the return wire being carried as near the flow as possible in the vicinity of the compasses.

Adjustment of Compasses

3. The compasses should be adjusted with the dynamo not working, after which the vessel's head should be put upon the different courses, with the dynamo running with open circuit and with all possible combinations of the current switched "on" and "off," all circuits passing near the compasses. These indications should be compared with those obtained with the dynamo stopped, and any serious deflections of the compasses remedied before the vessel sails.

SHOW CASE ILLUMINATION

A display stand which, when placed on top of a glass showcase, will throw a light downward to illuminate the wares in the case, is a new development of camouflage. The effect of the illumination, whose source is not apparent, is very mysterious. The effect is produced by a light concealed in the hollow base, but the stand looks so useful otherwise that it is not suspected.

Technical Hints

BY GEORGE A. SCHNEIDER

(Formerly the reverse phase relays were required only by certain central stations in various parts of the country, but more recently the question of such protection has been taken up by the Bureau of Standards and recommendations for relays of this type have been included in the National Safety Code. The Board of Fire Underwriters has now taken the matter up, and a ruling making the installation of reverse phase relays mandatory for certain classes of service is being included in the 1918 issue of the National Electrical Code. This article on the type of relays and the service which may be expected of them, is therefore of particular and timely interest.—The Editor.)

REVERSE PHASE RELAYS

Reverse phase relays are used in connection with control equipments for polyphase motors operating elevators, hoists, conveyors, cranes, machine tools, textiles and similar machinery. Their function is to guard against injury to operator, damage to machinery or manufactured product which might occur during a reversal of motor rotation in case of an accidental interchange of motor leads or wiring between the motors and source of power. A reversal of any two wires of a three-phase motor circuit or the wires of either phase of a two-phase motor circuit will cause reversed direction of rotation. This is the principle employed in polyphase motor controllers or systems of control. However, an accidental reversal of rotation may produce destructive results. This is particularly true in connection with elevator equipments. Movement of the car in a direction opposite to normal due to an accidental interchange in the leads would be very likely to confuse the operator. If there are no protective devices to guard against it, this may result in more or less damage to the elevator mechanism due to the car running wild and striking the overhead beams at the upper limit of travel or becoming jammed in the pit at the bottom of the shaft, or may result in personal injury or loss in life.

A reversal of the phase or the wires of a polyphase circuit, while not necessarily of frequent occurrence, is apt to occur at any time and is a factor which should always be considered and guarded against by the provision of suitable protective devices. Reversals may accidentally occur, especially on aerial systems, during repairs due to storms, fires or other causes, or when making extensions to lines or changes or repairs to the individual service. Likewise reversals may also occur in the interior wiring or other apparatus due to re-wiring or making repairs or changing defective apparatus such as controllers, circuit breakers, switches, motors, etc.

The most commonly used equipments for protection against phase reversal consists of a reverse phase relay in conjunction with a suitable shunt trip or under-voltage circuit breaker. However, there is one line of reverse phase protective devices on the market in which a spring operated switch is employed. Under normal conditions this switch is held open by the phase reversal device, but in case of reversal the switch is tripped and short circuits the leads to the motor. The circuit must then be interrupted by some other equipment such as a circuit breaker or fuses having suitable overload characteristics.

Reverse phase relays may be either of the series or potential type and may be fitted with either circuit opening or circuit closing contacts. Circuit opening contacts are used to open the control circuit of contactors or of an under-voltage release attachment on oil circuit breakers or other devices. Circuit closing contacts are used with devices that are equipped with shunt trip coils. These relays may be of the automatic or hand reset type. That is, in the automatic type the contacts are restored to normal position when the circuits are again re-established in proper phase relation, while in the hand reset type the relay contacts must be manually reset after each operation.

Some of these relays will protect the motor against phase failure as well as phase reversal. For this reason some are known as phase failure and phase reversal protective devices. It is therefore necessary to differentiate between a phase reversal and phase failure device, although many of the so-called reverse phase devices on the market will also give protection against phase failure as just noted.

At this point it should be noted carefully that while certain types of phase reversal protective devices will also protect against phase failure, a device which will protect against phase failure will not always protect against phase reversal. For example, any type of circuit breaker or even a fuse equipment that will give proper overload protection to a polyphase motor will also prevent single-phase operation because of the considerable increase in current even with the motor operating without load or under light load. This question was discussed quite fully in the October 15th issue of the Journal of Electricity in this department. It is recommended that our readers study that article in connection with this one.

The standard definitions applying to the kind of protection secured by these devices as adopted by the Electric Power Club, are:

Phase failure protection. The effect of a device operative on the failure of power in one wire of a polyphase circuit to cause and maintain the interruption of power on the remaining circuit.

Phase reversal protection. The effect of a device operative on the reversal of phase relations in a polyphase circuit to cause and maintain the interruption of power in all of the circuits.

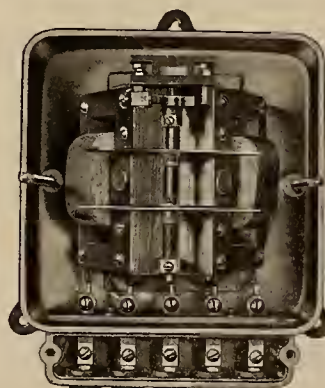


Fig. 1.—Reverse phase relay with casings removed

One well-known type of reverse phase relay is illustrated in Fig. 1. This relay is a potentially operated device. The electrical elements consist of two laminated iron electro-magnets, the coils of which are connected directly across opposite phases of the supply current. A vertical shaft supported by bearing pivots carries two aluminum sectors which are partially enclosed by air gaps in the magnet circuit. The magnets are so placed that when energized from a polyphase circuit a rotating field is produced. This field acting upon the sectors causes the latter to rotate in a direction dependent upon the phase rotation of the supply circuit. A con-

tact attached to the shaft and receiving current through a flexible connection, makes or breaks the trip coil circuit of the accompanying circuit breaker, according to the style of contact used, when the direction of phase rotation is such as to cause the relay to operate. The device is mounted in a substantial dust-proof iron case, with sealable wing nuts, and terminal chamber having binding posts for the connection leads. The device may be used on either two or three-phase circuits.

This style of relay is supplied with either circuit opening or circuit closing contacts. In the event of phase reversal the relay with circuit closing contacts closes the auxiliary circuit which energizes the trip coil of the circuit breaker, which must be of the shunt trip type, thus opening the main circuit. When used in conjunction with an under-voltage release circuit breaker, the relay is equipped with circuit opening contacts. In this case the action of the relay is simply reversed, the auxiliary circuit being opened in event of a phase reversal and thereby tripping the main circuit breaker. This device will also operate in case of phase failure due to a blown fuse, broken wire or similar cause.

Another type of relay which is described by the manufacturer as a phase failure and phase reversal protective device is shown in Fig. 2. In construction it is much similar to a miniature polyphase squirrel cage motor, but is arranged to be mounted with the shaft in a vertical position. Like the other type of relay already described, this device is equipped with contacts which are connected in series with the auxiliary tripping or operating circuit of the main circuit

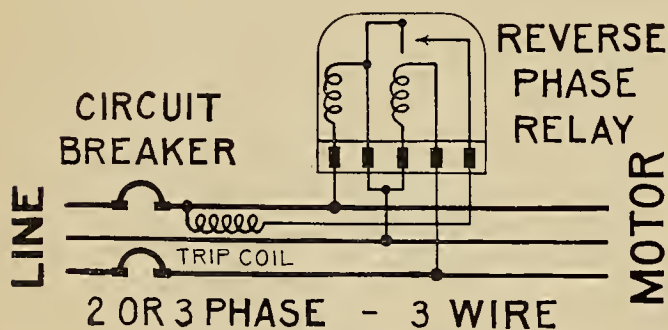


Fig. 3.—Circuit closing relay with shunt trip breaker

interrupting device. Circuit opening contacts are standard, but circuit closing contacts can also be supplied when required. This device is generally used in conjunction with a magnet switch or contactor which automatically opens and closes as the contacts in the device open or close the control circuit of the switch.

The manufacturer of this device states that it is designed to perform the following functions:

(a) If the supply voltage falls below 70 per cent of normal, the relay opens the control circuit of the motor controller, and keeps it open until the line voltage returns to at least 85 per cent of normal.

(b) In case of phase failure, caused by the opening of one of the supply lines at any point, the relay opens the control circuit, if the motor is under appreciable load, and keeps it open until the fault is corrected. If the load on the motor is very light, so that no harm would result from its running single phase on account of the phase failure, the device may not

operate until the load is increased or the motor shut down.

(c) In case of phase reversal the relay opens the control circuit and keeps it open until the phases are re-connected in the proper order.



Fig. 2—Phase failure and phase reversal protective device (cover removed)

In order to obtain the maximum protection, reverse phase relays should be connected to the circuit as close to the terminals of the motor as possible. Under this condition the motor will be protected against reversals which may occur in the interior wiring, or at the switches or other apparatus, installed in connection with the motor. Where motors are reversed by a switch or con-

troller in order to reverse the direction of an elevator or other machine, the relay must be connected between the source of supply and reversing switch or controller of the electrical equipment.

Where motors are connected to the elevator mechanism by a straight and cross belt, the relay should be connected between the controlling switch and motor. For motors operating screw pumps, on hydraulic systems, the relay should be connected between the controlling switch and the motor. Where two or more elevators or other machines requiring protection against phase reversal are connected to the same service, it is advisable to provide a separate relay and circuit breaker for each, in order that the relays may be connected close to the motor terminals.

The connections for the type of relay illustrated by Fig. 1 are shown in Fig. 3. In this diagram the equipment consists of a circuit closing relay in conjunction with a double-pole circuit breaker of the shunt trip type. It will be noted that the magnet coils of the relay are connected directly across two of the phases and the contact within the relay is placed in series with the breaker trip coil so that when the contact is closed the trip coil receives the full voltage measured across one phase. It will further be noted that fuse protection for the control circuit is not provided. There is very little likelihood of trouble in such circuits and it is better to connect in solid, as it adds to the reliability of the equipment. However, the control circuits should always be protected from mechanical injury.

As pointed out in another paragraph, some relays are fitted with hand reset contacts. This feature is a safeguard and also serves as an indication of the cause of the automatic opening of the motor circuit. With the hand reset feature it is necessary for the operator to go to the relay and reset the contacts before the motor can be thrown on the line again.

WASTE IN POSTAGE

Up-to-date business concerns eliminate the wasted postage item by enclosing a blotter advertising novelty of some sort. Thus by utilizing the waste which would otherwise be velvet to the postoffice department, the business man insures that each of his letters, whether it concerns sales, orders, complaints, or financial matters, is doing its duty in promoting and explaining some feature of the concern's business.

PRIZE WINNERS IN SUBSCRIPTION CONTEST

The Journal of Electricity herewith announces with deep gratitude and appreciation the results of the subscription contest which has been under way during the past ninety days, and which closed promptly at midnight January 31, 1918. The subscriptions that have come in from all quarters, bearing the names of central station managers, commercial men, jobbers, industrial engineers, manufacturers, manufacturers' agents, utility bonding houses, electrical engineers, teachers of electrical engineering, and electrical contractor-dealers, are indeed most gratifying. By letter and wire the entire country west of the Rockies attested the interest and enthusiasm of the readers of the Journal in its success.

J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, was literally swept into first place by the avalanche of subscriptions that came in on the final day of the contest from electrical contractor-dealers and central station men.

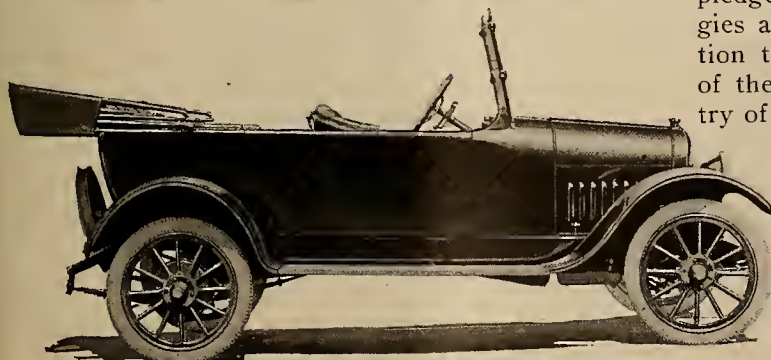
C. B. Merrick, the winner of the second prize, proved a consistent and effective worker among professional men in the industry. As a graduate of the electrical engineering department of the University of California, and as a former central station man, his subscriptions among engineers and power men proved of high order.

Although the Utah Society of Electrical Contractors and Dealers were in the lead for a long period of the contest, and finally won but third place, still the enthusiasm was such that practically every contractor-dealer and central station man of prominence in that commonwealth is now upon the subscription list of the Journal of Electricity.

The detail report of the judges of the contest is as follows:



J. W. Redpath taking possession of his new automobile



Maxwell touring car offered as first prize

San Francisco, Cal., February 8, 1918.

Journal of Electricity,
San Francisco, Calif.

Gentlemen:

After careful investigation of the records submitted in the Journal of Electricity subscription contest, your committee of judges find that the following are the winners of the several prizes offered on the basis of number of points credited to them:

First Prize: J. W. Redpath, Secretary California Association of Electrical Contractors and Dealers, 3380 points.

Second Prize: C. B. Merrick, research engineer, Rieber Laboratories, San Francisco, 1925 points.

Third Prize: Utah Society of Electrical Contractors and Dealers, 1790 points.

Fourth Prize: W. R. Herstein, electrical supply company, Memphis, Tenn., 580 points.

Fifth Prize: J. W. Oberender, Secretary Oregon Society of Electrical Contractors and Dealers, 520 points.

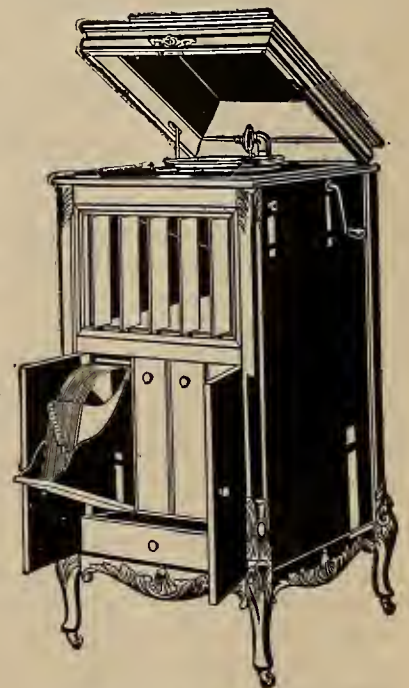
Sixth Prize: H. F. Schultz, Electric Appliance Company, San Francisco, 245 points.

Seventh Prize: M. S. Orrick, assistant sales manager, Western Electric Company, San Francisco, 120 points.

Very truly yours,

H. F. JACKSON,
ALBERT H. ELLIOT,
H. C. REID.

In making this announcement of the splendid outcome of the subscription contest, the Journal of Electricity desires to express again its heartfelt appreciation of the support manifested by the readers and well-wishers of the Journal of Electricity, and in response to this evident goodwill for the Journal, apparent on all sides, the Journal pledges again its energies and its consecration to the upbuilding of the electrical industry of the West.



Grafonola offered as second prize in Journal of Electricity subscription contest, won by C. B. Merick

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(If you are granted a license to manufacture a patented article, you may not have the right to sell it. The differences between an assignment, a grant and a license in relation to patent rights are so intricate and complex as to require the nicest legal discrimination in their application. A court decision which points plainly the type of invention which is recognized as patentable—and a description of recent ideas by Western inventors are further included. The authors are members of a well-known firm of patent attorneys in San Francisco.—The Editor.)

TRANSFER OF PATENT RIGHTS

Assignment

The monopoly, granted by a patent, comprises three exclusive rights, to-wit: First, the right to prevent all others from making the patented article; second, the right to prevent all others from using the patented article; and third, the right to prevent all others from selling the patented article.

The entire title to a patent or an undivided part thereof, throughout the United States, may be transferred by an instrument in writing called an assignment.

The transfer, for a specified territory less than the United States, of the three rights comprising the patent monopoly, is called a grant.

Such an assignment or grant must be in writing, but no particular form thereof is prescribed by the patent laws. An assignment or grant should be recorded in the United States Patent Office within three months after the execution thereof, because, unless so recorded within said period, it is void as against a subsequent purchaser for value without notice of such prior instrument.

The execution of an assignment or grant should be acknowledged before a notary public because the notary's certificate of such acknowledgment is prima facie evidence of the execution or signing of the instrument by the patent owner.

Rights of action for the past infringement of a patent are not conveyed by an assignment or grant unless they are specifically referred to therein and transferred thereby. It is, therefore, advisable to insert in the assignment a clause conveying all rights of action for past infringement of the patent.

During the pendency of an application for a patent, an assignment may be made of the patent that may be finally granted on such application. Such an assignment should contain a request that the patent be issued to the assignee.

License

A license is a privilege or permission given by the patent owner to the licensee to exercise a portion of the rights conferred by the patent. For instance, the grant of the exclusive or non-exclusive right to make a patented article, within a specified territory, would be only a license, as the exclusive rights to use and sell such article within such territory are not transferred by such a license. The transfer of the exclusive right to make, to use and to sell such article in such territory would be a grant because such a transfer would include all the rights for such territory conveyed by the patent.

If a licensee is given the exclusive right to make

and sell a patented article in the State of California, he could not prevent anyone from buying such article in Nevada from a licensee for such state and then using it in California, because, under the terms of his license, he does not have the exclusive right of using the article in California.

Due to the complex nature of the patent monopoly and to the various principles of law controlling the interpretation of patent assignments, grants and licenses, many complications and unforeseen difficulties may arise if such instruments are attempted to be drawn by those not thoroughly familiar with the patent law.

Licenses may be oral or written and expressed or implied. The law makes no provision for the recording of licenses.

Unless a license specifically provides it may be transferred by the licensee, it is personal to the licensee and cannot be conveyed by him to another.

A license runs for the life of the patent unless some specified term is mentioned therein.

Decision Involving Question of Invention

In a recent case, heard by the Court of Appeals of the District of Columbia, the question decided was whether or not it required invention, on the part of the applicant for a patent, to take the step he did in view of the prior art disclosures of two German patents and one Austrian patent.

The combination of elements, comprising the applicant's invention or contribution to the art, was described in his claim as follows:

"A slow-consuming luminous arc light electrode comprising a metallic shell and a filler composed principally of rutile [titanium oxide] and sodium silicate, substantially as and for the purpose described."

Regarding his said structure, the applicant said: "I have found that an electrode constructed as described will give a practically steady, strong, white light and will last from one and one-quarter to twice as long as other luminous arc electrodes operating under the same conditions, and will be more perfectly consumed, so that less soot is deposited than that with any other luminous arc electrode."

The following is a tabular comparison of the applicant's structure with the three prior structures respectively disclosed in the two German and the Austrian patents:

First German patent = iron tube + titanium oxide + iron filings.

Second German patent = iron tube + titanium oxide + iron filing + sodium silicate.

Austrian patent = iron tube + titanium oxide and expressly omitting iron filings and sodium silicate.

Applicant's structure = iron tube + titanium oxide, + sodium silicate and expressly omitting iron filings.

The foregoing shows that applicant refused to be guided by any one of said foreign patents. In his structure, the applicant omitted the iron filings present in both German structures, but omitted in the Austrian structure, and he used the sodium silicate found in the second German structure but omitted in the first German and in the Austrian structure.

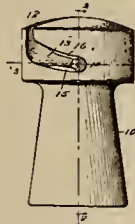
The court, in finding it amounted to invention to make the applicant's combination, said:

"It is no argument against patentability that applicant's invention consists of a combination of elements old in the art. * * * It is conceded that the art has not been developed to the point where accurate results may be obtained by reasoning from cause to effect. Development depends almost wholly upon experiments. The present case is not one where the advanced step taken by the applicant, even by the combination of elements old in the art, belongs in the realm of mere mechanical improvement obvious to one skilled in the art."

NEW IDEAS FROM THE WEST

Insulator

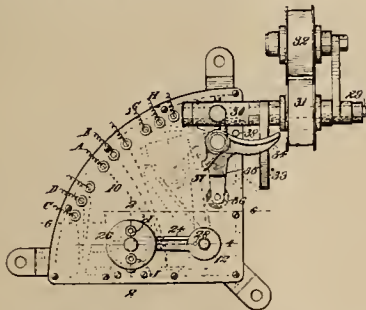
Patent No. 1,251,416, issued to Benjamin S. Purkey of Tacoma, Washington, shows a new form of insulator which is designed to firmly grip and hold the line wire without the use



of any auxiliary clips or clamps. The head of the insulator is provided with a diametrical spiral wire receiving slot in which the wire moves to a seat as the insulator is turned on the wire. When in its seat the wire lies in a straight, undeflected path diametrically across the insulator and is held in place against axial movement by ridges on the groove which bite into the wire.

Emergency Stop for Electrically Driven Apparatus

Patent No. 1,250,708, issued to Caswell D. Swett of Redwood City, California, discloses a novel and apparently meritorious emergency stop for electrically driven apparatus. The object of the invention is to provide an apparatus for instantly stopping electrically driven apparatus in the event of

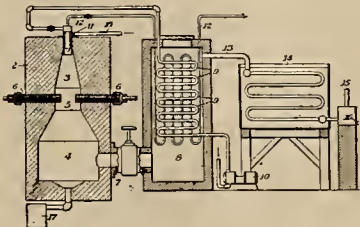


accident or other emergency. The apparatus operates to reverse the current through the motor so that it tends to rotate in the opposite direction or does rotate in the opposite direction and opens the electric circuit on the initial reverse movement of the driven apparatus so that all movement of the apparatus is arrested. The apparatus consists of a pole changing switch in the motor circuit which is held in position to close the forward driving circuit by a latch and

which is provided with a spring for moving it to the reverse driving position when the latch is released. When the latch is tripped, the switch moves instantly into the reverse position, causing the motor to stop suddenly and reverse its direction, and thereby reverse the direction of rotation of the driven element. The switch is connected to the driven element so that the instant that its direction of motion reverses, the switch is moved to neutral position.

Apparatus for Fractionating Hydrocarbons

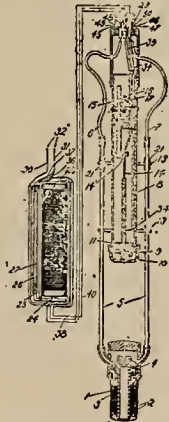
Patent No. 1,250,879, issued to Leon E. Hirt of Los Angeles, California, discloses a new method of and a new apparatus for fractionating hydrocarbon oils, by the use of the electric arc. The oil is first heated to vaporization and is



then flowed into a closed retort and maintained under controllable pressure and subjected to the action of an electric arc within the chamber. The arc breaks down the vapor into a plurality of fractionated vapors which are conducted from the chamber and condensed.

Water Heater

Patent No. 1,251,210, issued to Ida R. Forbes of Los Angeles, California, shows an electrical water heater employing a rather complex system of control. The heater consists of a tank in which is arranged an adjustable thermostat which



controls the circuit of an electro-magnet arranged externally of the tank. The electro-magnet is connected with circuit controlling means arranged in the heating element circuit, so that when the heating element has raised the temperature of the water to the point at which the thermostat is set, the electro-magnet is operated to open the circuit of the heating element.

Rectifier

Patent No. 1,251,269, issued to Harry A. Mulvany and Harry E. Kennedy of Berkeley, California, and assigned to the Electric Sales Service Company of San Francisco, discloses a novel form of rectifier. The device consists of a pair of electrodes, one of which is a metallic screen and the other of which is a pointed rod which is spaced from and pointed toward the screen. The pointed rod is heated to a temperature sufficiently high to establish a discharge of cathode rays from it toward the screen, and a current of air is blown over and through the screen to remove ionized air and metallic gases from between the electrodes, and to cool the screen. The screen is arranged over an aperture in a rotatable plate and vanes are provided on the rear side of the plate radiating from the aperture, so that when the plate is rotated a current of air is drawn through the screen.

SPARKS—Current Facts, Figures and Fancy

(A burglar alarm, an electrically served pipe line system which carried water to the armies in the desert, a barbershop device, and a new development in theater lighting, testify to the variety of uses to which electricity may be put. The future is going to bring its sad problems of the provision for those maimed in war, and the training of the blinded for certain branches of electrical work will play an important part in this country's work of reconstruction, as it has abroad.—The Editor.)

Had not electricity and engineering made passable the desert of Sinai, Jerusalem might not have been in Allied hands now. A broad-gage railroad line was laid over the desert and an American pipe line, fed by electric pumps, carried water from the Nile to the advancing troops.

* * *

A realization of the ups and downs of our world is obtained from that brief notice which reports aeroplanes as flying four hundred feet below sea level in the Dead Sea region. Of course, the Dead Sea lies 1292 feet below the surface of the Mediterranean, so that aeroplanes sailing 400 feet below sea level were still at an elevation of 892 feet.

* * *

Not many people in the electrical world realize that the patentee of the typewriter invented it for use as a punch in making raised characters on sheets of paper in finger-reading books by the blind. And the inventor himself certainly did not realize that two hundred years later China would be buying thousands of machines annually.

* * *

For the electrical man who has been wont to paint his electrical apparatus when the black enamel finish nicked off, with patchwork effect, the following mixture is suggested: Asphalt, one pound; lamp black, one-quarter pound; resin, one-half pound; spirits of turpentine, one quart; and enough linseed oil to make the lampblack into a paste before mixing it with the other ingredients. Mix thoroughly and apply with a varnish brush.

* * *

The modern barbershop, in war and in peace, has found good use for electricity. An electric light attachment to be used with a safety razor has recently been developed, complete with razor, trench mirror, strop handle and extra blades. The attachment can also be used to advantage with a pencil or fountain pen. A new electrically operated hair-clipper has been designed to save much of the barber's time. It is to be hoped it will at the same time trim a bit off the high cost of haircuts.

* * *

Several novel features were recently worked out in stage lighting by the Little Theater at Hollywood, Cal. Looking through the gates of the walled city the spires, domes, trees, etc., in the distance, constituted an important part of the plot. This was produced by fastening on the back of a white canvas screen a piece of brown wrapping paper cut to form the outline required. Upon this was directed a floodlight adjusted properly as to direction, intensity and equipped with color screens to obtain the color-quality desired. The

silhouette produced imitated the city with light and shadows, evenly blended. Large Type C lamps in proper shades and diffusers, together with floods and color screens, were used.

* * *

A new use of electricity is being made by a separator company, which has installed a dust precipitator on its smokestacks, so that obnoxious particles in the smoke and fumes will not settle on the land in the vicinity of the zinc ore roasting plant. Incidentally, the dust thus saved is of value. The general scheme used for this purpose is to raise the voltage to about 100,000 volts and then rectify it and charge the equipment in the stack, which in turn charges the dust particles and causes them to precipitate in the bottom of the stack.

* * *

A burglar alarm, actuated by a sensitive selenium cell, which will sound a warning when illuminated by a match at a distance of 10 metres, is reported as a recent German invention. It can easily be concealed in a room and can be situated with its wiring at a distance from the valuables it is intended to protect, in an inaccessible position. As a burglar can hardly work without a light, the idea might prove feasible—with the obvious drawback that the owner would have to arise at dawn to prevent the alarm from waking him at sun-up.


* * *

Blinded soldiers are happy in finding that electricity offers another field for their limited talents. Several hundred men who received work shop practice in wiring, the use of simple tools, power house demonstrations, electrical and physical laboratory work, class demonstrations in the elements of electrical engineering and physics, the writing of reports, and an oral examination, are now engaged as electrical operators and substation attendants. Much has been done along this line in England, and similar work is being arranged for in this country.

* * *

Electrically heated gloves are suggested for the use of chauffeurs who must drive in excessively cold weather. The gloves have resistance wires set in the back, between two layers of thin sheet asbestos; connection is made to the electric light terminals at the most convenient points, and the fine flexible wires are attached to the wrist of the gloves by means of press-on buttons. The wires are of sufficient length not to interfere in any way with driving. When it is necessary for the driver to leave the steering wheel of the car, the wires can be instantly disconnected from the gloves merely by a pull on the press-button connections.

PERSONALS



Albert S. Schwabacher of San Francisco has been appointed federal fuel administrator for California. In his new duties, Mr. Schwabacher will pay especial attention to increasing the production and conserving the output of crude petroleum. Since California's production of fuel oil now falls short of a million barrels monthly in meeting the war service demands, Mr. Schwabacher's activities will be watched with the keenest attention by men interested in power generation in the West, since in the production of steam electric supply crude petroleum is of prime importance.

H. H. Jones, manager of the San Diego Light & Power Company, spent a few days in San Francisco recently.

Geo. L. Myers has succeeded C. R. Young as editor of the Pacific Power and Light Bulletin, of Portland, Oregon.

C. W. Chestnut, sales manager of the Western Electric Company, Seattle, spent a week visiting in Portland recently.

Edw. A. Bullis of the Federal Sign System (Electric) has gone to Philadelphia to take up work with the Wirth Electric Company.

George Hawley has been appointed resident engineer for the East Bay Water Company, in charge of the construction of the San Pablo dam.

H. J. Gille, sales manager for the Puget Sound Traction, Light & Power Company, Seattle, Wash., has returned from a business conference in New York.

Colonel E. E. Nash, treasurer of the Peerless Lamp Division of the National Lamp Works of the General Electric Company, is a recent visitor in Los Angeles.

W. R. Putman, division manager of the Utah Power & Light Company, Salt Lake City, Utah, has been made a director of the Utah Manufacturers' Association.

Leonard Metcalf, consulting engineer of Boston, Mass., is spending some time in San Francisco, where he is giving expert testimony before the Railroad Commission.

C. J. Tonjes, a mechanical engineer of Soerabaia, Java, and B. B. Braat, a manufacturer of electrical machinery of the same locality, are recent visitors in San Francisco.

E. M. Dobb, manager of the lighting fixture department of the Capital Electric Company of Salt Lake City, has been a visitor in San Francisco during the last few days.

T. A. Barton of the lighting department, General Electric Company, Schenectady, visited Seattle recently and inspected substations and power plants in that vicinity.

J. A. Royster, electrical inspector for Martinez, Cal., for the last three years, is master signal electrician of the 332nd Field Signal Battalion, stationed at Camp Lewis, Wash.

James F. Pollard, formerly with the engineering staff of the California Railroad Commission, is now manager of the commercial department of the Sierra and San Francisco Power Company.

W. D. McDonald, district manager at Seattle, Wash., and C. W. Davis, district manager at Dallas, Texas, both of the Westinghouse Electric & Manufacturing Company, are San Francisco visitors.

Lester H. Hibbard has left Los Angeles to accept a position with the Stone & Webster Engineering Corporation, in connection with the construction work this concern is doing in France for the federal government.

A. D. West, general manager of the Southern Sierra Power Company, was a recent visitor in San Francisco, where he attended the meetings of the Railroad Commission.

Allen Hazen, the well-known hydraulic engineer of New York City, is at present in San Francisco, where he is testifying as a valuation expert in the Spring Valley rate case.

M. A. Bray, who has had an important part in the handling of the railway construction work for the Pacific Power & Light Company of Portland, Oregon, has recently resigned.

J. A. Cranston, district manager of the General Electric Company northwest offices, Spokane, Portland and Seattle, with headquarters at Portland, spent three days in Seattle recently.

W. D. Kohlwey, of the Kohlwey-Smith-Alfs Electric Co., San Francisco, was a recent Portland visitor. While there he called a meeting of the Pacific division of the National Contractors' Association.

Robert Nowland, of the San Diego Consolidated Gas & Electric Company, San Diego, Cal., has resigned from his business connection to join the U. S. Aviation Corps, and is now in training at Foggia, Italy.

Burton R. Stare, of the Burton R. Stare Company, dealers in electrical apparatus and specialties, Seattle, is making a trip to the East which will take him to Chicago, St. Louis, Pittsburg and New York.


M. L. Kilbourne, present branch manager of the Shipowners' Radio Service in San Francisco, has been transferred to Seattle to take charge of the office at that point, and will have the title of division superintendent.

Frederick W. Johnson of the Puget Sound Traction, Light & Power Company, has been appointed assistant to E. C. Macy, in charge of construction work for Stone & Webster in the northwest, with headquarters in Seattle.

A. L. Strickland has been appointed district manager for the Pacific Power & Light Company at Seaside, to take the place of Harlow Moore, who resigned to accept a position with the Board of Fire Underwriters in Portland.

Emmett N. Britton, the youngest son of John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been promoted from second lieutenant to first lieutenant in the 363rd Infantry at Camp Lewis.

R. H. Walker has resigned as secretary of the Electric Heating and Manufacturing Company, and as vice-president of the Electric Sales Corporation, Seattle, and has severed his connection with these companies. Holdings of Mr. Walker have been taken over by P. F. Apfel, president of the Electric Sales Corporation. A. M. Stevens has been chosen to succeed to the offices and trusteeships heretofore held by Mr. Walker.



John Cushing Stone, formerly assistant traffic manager of the Northern Electric Railway, has been appointed traffic manager of the Central California Traction Company, succeeding Major E. L. Stern. Mr. Stone will assume his new duties March 1st, and he will have headquarters at Stockton, although considerable of his time will be spent in Sacramento. Mr. Stone has spent his entire life in railroading, having served the Southern Pacific Company in its general freight office in various capacities, and later was promoted to traveling freight agent at

Stockton. Later he was district freight and passenger agent for the same company in Sacramento. After leaving the Southern Pacific, Mr. Stone for two years was general freight and passenger agent for the Hilo Railroad Company of Hilo, Hawaii. He returned to California in July, 1914, to enter the traffic department of the Northern Electric Railway.

George L. Hedges has resigned his position with the Kelman Electric & Manufacturing Company of Los Angeles to report to Washington, D. C., for active duty as first lieutenant in the Officers' Reserve Corps, Ordnance Department.

A. C. Bradley, superintendent of the northern division of the Pacific Electric Railway, Los Angeles, Cal., has also been appointed superintendent of the eastern division of the company, to succeed G. P. Groftholdt, the two divisions being consolidated.

Roy C. Taylor, for the last ten years secretary to Franklin T. Griffith, president of the Portland Railway, Light & Power Company, has resigned to join the legal staff of Griffith, Leiter & Allen, attorneys for the Portland Railway, Light & Power Company.

C. B. Cooper, general superintendent of the Shipowners' Radio Service, a subsidiary concern of the Kilbourne & Clark Manufacturing Company, Seattle, has been chosen manager of the New York office of the latter concern, but still retains the old position.

L. K. Cushing, secretary of the Illinois Electric Company of Chicago, has arrived in Los Angeles, where he will spend some weeks in the Southwest. Mr. Cushing reports that the climate is good and that he is enthusiastic over the prospects in the Golden State.

James D. Blackwell, now a candidate for the city council of Seattle, was at one time chief engineer and superintendent of construction for the Seattle Electric Company. More recently Mr. Blackwell has been connected with the firm of Hanford & Blackwell, civil and consulting engineers.

W. W. Briggs, general agent of the Great Western Power Company, has resigned in order to accept an executive position with the Westinghouse Lamp Company. Mr. Briggs leaves shortly for the East, and his many friends in the West wish him all good fortune in his new field of activity.

Charles H. Rattray, construction engineer for the General Electric Company, recently returned to Seattle from China and Japan, where he installed machinery and inspected shipbuilding plants in the latter country. On his way back he visited Honolulu and viewed the volcano Kilauea near that city.

D. W. Pontius, traffic manager of the Pacific Electric Railway, of Los Angeles, Cal., has been appointed general manager of the San Diego and Arizona Railway, with headquarters in San Diego, Cal. Mr. Pontius began railroad work 25 years ago in Ohio as supervisor of track on the Pennsylvania system.

Joe Madden of the electric distribution department of the Pacific Gas & Electric Company, who has been chief electrician on the battleship "Oregon," has been transferred to the "New Mexico," which has the reputation of being the biggest battleship afloat. He will serve as chief electrician on this monster of the seas.

M. J. Perrin has been appointed manager of transportation of the San Diego Electric Railway, Point Loma Railroad and San Diego and Coronado Ferry Company, of San Diego, Cal. The position of superintendent has been abolished. All departments having heretofore reported to the superintendent will hereafter report to the manager of transportation.

A. L. Valentine, superintendent of public utilities, J. J. McCullough, in charge of the unified management of the Seattle Railway terminals, and Guy A. Richardson, superintendent of the Puget Sound Railway, Traction, Light & Power Company, are members of a committee specially appointed to care for the transportation situation in the Northwest, now extremely congested owing to the phenomenal growth of the shipbuilding industry.

Carl Johnson, son of Chas. P. Johnson of the Johnson Washing Machine Company of San Francisco, was severely wounded recently in the trenches in France. Particular significance is attached to the message of Johnson's injury by reason of the fact that he was a drafted man, taken into service last November and sent to Camp Lewis. It indicates the rapidity with which men are being sent forward into the war zone for actual service.



Some California soldiers at Camp Funston. The man with the X under him is Lieutenant W. H. Johnston of the San Francisco Stock Maintenance Division of the Western Electric Company.

F. W. Taylor, general purchasing agent of the Pacific Electric Railway, of Los Angeles, Cal., has been appointed purchasing agent of the Southern Pacific Company, of San Francisco, Cal. He has been with the company since the consolidation of the lines in 1911. For 25 years Mr. Taylor was general storekeeper for the Oregon Short Line, at Pocatello, Idaho, and while acting in this capacity was busy in getting a line on standardization of railway materials and where to save.

D. C. Jackling, San Francisco, who has been given charge of facilities for supplying explosives needed by the government, will supervise the construction of a government powder plant near Nashville, Tenn., estimated to cost \$60,000,000. Mr. Jackling was formerly managing director of the Utah Copper Company, and in a similar manner controlled extensive mining and milling operations in Arizona and New Mexico. In these operations he directed large forces and provided electric power on a big scale.

J. R. Tomlinson, secretary-treasurer of the Pierce-Tomlinson Electric Co., left for St. Louis on January 18th to attend a meeting of the National Executive Committee in company with W. D. Kohlwey of San Francisco. Mr. Tomlinson had to leave on short notice, as S. C. Jagger, the regular Ore-



W.S.S.
WAR SAVINGS STAMPS
ISSUED BY THE
UNITED STATES
GOVERNMENT

THRIFT STAMPS

Patriotic citizens by the thousands are subscribing to the war savings stamps issued by the United States Government. An average of twenty dollars per capita—twenty dollars for each man, woman and child in America—is asked during 1918 from this source. The putting across of this splendid scheme is most helpful to the government at this critical period in our national life, and at the same time it is the most remarkable plan for encouragement of thrift among the young and old ever initiated. Are you doing your part?

gon member of the committee, found it impossible to attend. Mr. Tomlinson has been identified in the past with the national movement and was the state chairman on Permanent Organization.

J. I. Colwell and **Harry Byrne** of the North Coast Electric Company, Seattle, have returned to Seattle after attending the quarterly meeting of the Pacific Coast Section of the Supply Jobbers' Association, held at Del Monte, California, January 24, 25 and 26. Mr. Colwell was accompanied by Mrs. Colwell, who will visit relatives at Pasadena for several weeks.

J. F. NePage, of the NePage-McKenny Company, spent some time recently in Portland. Mr. NePage represented the Washington association at the meeting of the Pacific division and was elected one of the executive committee men from this division, but owing to unforeseen circumstances it was impossible for him to attend the present meeting at St. Louis.

William Gerig has been appointed as engineer in charge of the Anchorage Division of the Alaska Railroad, under the supervision of William C. Edes, chairman of the Alaskan Engineering Commission. Mr. Gerig has been for the past two years with the commission in the capacity of consulting engineer, and previous to that time had been for many years vice-president and chief engineer of one of the Hill lines in the Northwest, and had been for some time with the Panama Canal as engineer in charge of one of the construction divisions.

H. J. Hanzlik, chief engineer of the Kerr turbine engine plant at Wellsville, N. Y., designer of the marine engine that factory has begun building, spent several days in Portland recently to be present at the official trial trip of the steamer Westward Ho, installed in which is the first Kerr marine turbine to be tried out in the United States. The Port of Portland dredge Tualatin has a Kerr turbine engine and many of them have been used in shore plants, but it was not until the war was precipitated that the manufacturers turned to propulsion engines.

Major Frederick Mears, who has been for the past three years a member of the Alaskan Engineering Commission and in charge of the work at Anchorage, has been relieved at his own request of the duties in connection with that position. Major Mears had been specially detailed to the Alaska Railroad work from the War Department, but felt that in the present time of stress he should return to the army. The War Department is to commission him a colonel and place him in command of an engineering regiment which is to be engaged in railroad work in France.

George Fillmore Swain, professor of civil engineering in the Graduate School of Applied Science of Harvard University, will be the lecturer on the Hitchcock Foundation for 1918, according to announcement at the University of California. Professor Swain, a graduate of the Massachusetts Institute of Technology, has been consulting engineer for the Massachusetts Railroad Commission and for the Boston Transit Commission. He is at present chairman of the Railroad Commission of Massachusetts. He has been engineer for many large structures and has been a member of many commissions where his technical skill and business judgment have been required.

George C. Holberton, for many years manager of the San Francisco District of the Pacific Gas & Electric Company, has retired from service with the company in order to devote himself more fully to his large private interests. **H. A. Bostwick**, assistant to the first vice-president, has been put in charge of the San Francisco District with the title of general agent. **H. P. Pitts**, formerly head of the industrial department, now becomes manager of the commercial department of the San Francisco District. **J. E. Murphy** is made manager of the collection department, **F. E. Oldis**, superintendent of bookkeeping, addressograph and records, while **S. J. Lisberger**, as previously announced in the columns of the Journal of Electricity, is superintendent of electric distribution of the San Francisco District.

OBITUARY

E. A. Heron, who was president of the Oakland Traction Company, of Oakland, Cal., before its reorganization as the San Francisco-Oakland Terminal Railways, died recently at his home in Oakland, Cal., after a short illness. Mr. Heron was born in Galena, Ill., 65 years ago.

Dr. Frank W. Thomas, president of the Pomona Valley Telephone & Telegraph Union, of Pomona, Cal., died recently.

The Portland Convention of the Northwest Electric Light and Power Association

During the winter months while considerable activity and planning is under way in the southwest, especially in California, looking toward the successful consummation of the Del Monte convention of the Pacific Coast Section, N. E. L. A., eyes in the northwest are beginning to turn toward Portland and its promise for a successful convention of the Northwest Electric Light & Power Association in September. Under the able leadership of Guy W. Talbot affairs in this association are in excellent status.

Guy W. Talbot is president of the Pacific Power and Light Company, Portland, Ore. Mr. Talbot was born in Centerville, Mich., on August 12, 1873, and was educated in



Guy W. Talbot, president Northwest Electric Light and Power Association

the public schools of Des Moines, Iowa, and the College of Emporia. He entered railroad work in Des Moines in 1891, following that occupation until March, 1910. During that time he was successively traveling freight and passenger agent for the Des Moines, Northern and Western Railway, traveling freight agent for the Iowa Central Railway, general traveling freight agent for the same road, traffic manager for the Peoria and Pekin Terminal Railway, from which position he was promoted to be general manager and later to be vice-president, serving in the latter capacity from 1900 to 1905; vice-president and general manager of the Astoria and Columbia River Railway Company and Corvallis and Eastern Railway Company in 1905, and from 1906 to 1910 vice-president and general manager of the Oregon Electric Railway Com-

pany. Since 1910 he has been president and director of the Pacific Power and Light Company, the Portland Gas and Coke Company and the Walla Walla Valley Railway Company, all with headquarters at Portland.

Northwest Electric Light & Power Association Committees Appointed

President Talbot of the Northwest Electric Light & Power Association recently appointed the following committees for the Association year 1917-1918:

Public Policy Committee—Franklin T. Griffith, president, Portland Railway, Light & Power Company, Portland, Oregon, chairman; H. L. Bleecker, vice-president, The Washington Water Power Company, Spokane, Washington; Elmer Dover, vice-president, H. M. Byllesby & Co., Tacoma, Washington; F. A. Harmon, manager, Eastern Oregon Light & Power Company, Baker, Oregon; John A. Laing, vice-president, Pacific Power & Light Company, Portland, Oregon; A. W. Leonard, president, Puget Sound Traction, Light & Power Company, Seattle, Washington.

This committee is probably the most important committee of the association outside of the executive committee, which is its governing board. It concerns itself with all questions of public policy as they pertain to the electric light and power industry and its scope is very general, taking into consideration the larger aspects of all branches of the industry, such as legislation, regulation, legal, executive, operating, technical, sales, etc.

Hydro-Electric and Technical Committee—Geo. E. Quinan, engineer, Puget Sound Traction, Light & Power Company, Seattle, Washington, chairman; R. M. Boykin, engineer, North Coast Power Company, Portland, Oregon; J. B. Fiske, superintendent, The Washington Water Power Company, Spokane, Washington; L. T. Merwin, general superintendent, Northwestern Electric Company, Portland, Oregon; F. D. Nims, chief engineer, Northwestern Power & Manufacturing Company, Port Angeles, Washington; H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, Oregon. This committee covers all technical matters. It has for some time past principally concerned itself with a consideration of overhead line construction rules and regulations of state commissions, and has had much to do in co-operating with the Bureau of Standards at Washington, D. C., in determining questions of standardization for purposes of service and safety. This committee has arranged to actively co-operate with the Pacific Coast section of the National Electric Light Association through the appointment of Geo. E. Quinan as a member of the Engineering Committee of that section, of which committee J. E. Woodbridge, of the Sierra & San Francisco Power Company, chairman, has been named a member of this committee.

Labor Study Committee—S. R. Inch, general manager, Utah Power & Light Company, Salt Lake City, Utah, chairman; C. S. MacCalla, vice-president and general manager, the

Washington Water Power Company, Spokane, Washington; William H. McGrath, vice-president, Puget Sound Traction, Light & Power Company, Seattle, Washington. This is a new committee, the development into organization form of the investigation and research activities of Mr. Inch, to make comparison of wages, hours and working conditions in the territory covered by the association, to determine for the Utah Company conditions, more completely assuring the co-operation and continuity of service of labor, which has incidentally benefited the industry, but not in the serviceable form that will be the case when this committee gets to working officially. At this particular time the creation of this committee is of vital importance, owing to the difficulties that are constantly increasing in respect to labor problems as a result of the war and consequent diminishing supply of labor.

Electric Range Committee—W. R. Putnam, division manager, Utah Power & Light Company, Salt Lake City, Utah, chairman; M. C. Osborn, commercial agent, The Washington Water Power Company, Spokane, Washington; A. C. McMicken, sales manager, Portland Railway, Light & Power Company, Portland, Oregon. This committee is devoted solely to promotion of the development of the electric range industry. Questions pertaining to more universal use of the electric range were never more pertinent to prevailing economic conditions than at this moment. Where the nature of service is hydro-electric utilization of electricity for cooking is a positive aid to fuel conservation and more free and efficient operation of transportation facilities. The electric range is in a position to do its part in winning the war, and each company that encourages its use and each consumer is rendering a patriotic service in addition to increasing the earning condition of public utilities and giving cleaner and more convenient service to the consumer.

Program Committee—Lewis A. McArthur, general manager, Pacific Power & Light Company, chairman; Robert W. Clark, assistant sales manager, Puget Sound Traction, Light & Power Company, Seattle, Washington; C. P. Osborne, superintendent of power, Portland Railway, Light & Power Company, Portland, Oregon; George C. Sawyer, district manager, Pacific Power & Light Company, North Yakima, Washington. This committee concerns itself entirely with the preparation of the program for the forthcoming convention in September, 1918.

Entertainment Committee—C. R. Young, sales manager, Pacific Power & Light Company, Portland, Oregon, chairman; Geo. G. Bowen, sales manager, Northwestern Electric Company, Portland, Oregon; W. H. Lines, secretary to president, Portland Railway, Light & Power Company, Portland, Oregon; Carl L. Wernicke, manager, Westinghouse Electric & Manufacturing Company, Portland, Oregon. This committee has to do with providing entertainment for delegates to the annual convention.



WHAT THE SAD SEA WAVES SAY
While the work of the Northwest Electric Light & Power Association and the forthcoming Portland convention in September has been so interestingly outlined above for men of the electrical industry of the West, the call of the sea down at beautiful Del Monte is being heard. The importance of this war service convention of the Pacific Coast Section, N. E. L. A., April 24-27, 1918, is commented upon on the editorial page of this issue.

MEETING NOTICES FOR ELECTRICAL MEN

(The most important meeting of the past semi-monthly period has taken place at Portland, where the Pacific Division of the National Association of Electrical Contractors and Dealers has held a most helpful meeting. Plans for the September convention of the Northwest Electric Light & Power Association are outlined on the preceding page, while comment may be found in this issue on the editorial page concerning the Pacific Coast Section, N. E. L. A., Convention at Del Monte, Cal., April 24-27, 1918. Other meetings of interest are found on the following pages.—The Editor.)

Pacific Division of the National Association of Electrical Contractors and Dealers

The first meeting of the Pacific Division of the National Association of Electrical Contractors and Dealers was held at the Hotel Multnomah in the city of Portland, Wednesday evening, January 16, 1918. The following were present: W. D. Kohlwey, chairman of the National Affiliation for California; J. F. NePage, state chairman of permanent state organization and delegate to the Pacific Division for Washington; Samuel C. Jaggar, delegate to the Pacific Division for the State of Oregon; J. R. Tomlinson, state chairman of permanent organization; J. W. Oberender, secretary-treasurer of Oregon Association of Electrical Contractors and Dealers; Allan S. Halls, president Oregon State Association of Electrical Contractors and Dealers.

The meeting was called to order by W. D. Kohlwey, who presented to the meeting his authority from the National president, Robley Stearnes, for that purpose. Nominations and elections being then in order, W. D. Kohlwey was unanimously elected chairman of the Pacific Division of the National Association of Electrical Contractors and Dealers. Mr. Kohlwey thereupon assumed the chair and declared the meeting of the Pacific Division of the National Association of Electrical Contractors and Dealers open for the transaction of such business as might be properly brought before it.

On motion, duly made and seconded, J. W. Oberender was elected secretary-treasurer of the Pacific Division. The matter of election of two delegates as members of the National Executive Board was next considered, and the following were duly nominated, balloted upon and elected: One year term, Samuel Jaggar of the Morrison Electric Company of Portland, Ore.; two year term, J. F. NePage of the NePage-McKenney Co., of Seattle, Wash. The two delegates, together with the delegate at large, W. D. Kohlwey, appointed by the National president, were instructed to attend the National Executive Board meeting in St. Louis, January 22nd. It was decided to hold the next semi-annual meeting of the Pacific Division at the city of San Francisco, the exact date to be determined later.

A. I. E. E. Midwinter Convention

The Sixth Annual Midwinter Convention of the American Institute of Electrical Engineers will be held February 15 and 16, in the Engineering Societies Building, New York.

On account of war conditions the Meetings and Papers Committee, with the approval of the Board of Directors, has decided to make this convention purely a business meeting, and therefore no entertainment features or excursions have been included in the program.

The session on Friday morning will be devoted to the subject of Circuit Breaker Ratings. That of Friday afternoon to Meters and Measurements. The Friday evening session will be devoted to a lecture by Dr. A. C. Crehore, followed by discussion. This session will be of general interest to everyone, as the subject will be presented in a popular and non-technical manner. The session on Saturday morning will be devoted to the subject of Alternating Current Commutator Motors.

The San Francisco Electrical Development League

January 30, 1918, at the Palace Hotel, saw the joint meeting of the league members with the civil engineers of the San Francisco bay region. The meeting was well attended, Allen Hazen and Leonard Metcalf, two noted engineers of the East, being among those present.

H. J. Brunnier, structural engineer, and vice-president San Francisco Association, A. S. C. E., gave an introductory talk on "Co-operation between Civil Engineers and Electrical Men." Chas. D. Marx, professor of civil engineering at Stanford University, and past president American Society of Civil Engineers, spoke on "The Relation of Technical Training to Wartime Activities." Chas. G. Hyde, professor civil engineering department, University of California, talked of "The Relation of the University as an Institution, to Wartime Activities."

Nathan A. Bowers, Pacific Coast editor of the McGraw-Hill Company, and secretary of the San Francisco Association, A. S. C. E., acted as chairman of the day.

With an old-time record of the "Star Spangled Banner" on a pioneer phonograph, the Edison Day of the Electrical Development and Jovian League, on February 6th, was fittingly celebrated. The occasion was in honor of the seventy-first birthday of the noted inventor. E. M. Cutting, Pacific Coast manager of the Edison Storage Battery Company, as chairman of the day, introduced Frank Fagan, Pacific Coast manager Edison Lamp Works, who gave a brief review of Edison's wonderful progress. This was followed by motion pictures showing the early indications of inventive genius in the boy, and the later determination which has been so large a factor in Mr. Edison's success. The meeting was a large and enthusiastic one, and in view of the splendid type of American citizen represented in the life work of Mr. Edison, each went from the meeting with a firm resolve to do his bit for the nation in a more effective manner.

Portland Section, A. I. E. E. and N. E. L. A.

The joint meetings of the Portland Sections of the A. I. E. E. and N. E. L. A., were held in the Multnomah Hotel on Tuesday evening, February 5, 1918, at 8:00 p. m. This was

BUILDERS OF THE WEST—XXIII



EPES RANDOLPH

The closing of the Colorado River break—an almost insurmountable feat of engineering in the district of the Salton Sea in the Southwest—and the building of electric lines out into the stillness of a waste having alone this eternal characteristic as its claim to greatness, but later to become the feeders for a population of an empire, have been two mighty tasks that one constructive mind foresaw with an accuracy in accomplishment that has been a potent factor in the up-building of the West. To Epes Randolph, engineer and builder with the Pacific Electric Company in Southern California, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his mighty accomplishments.

ladies' night and after a short talk by Professor Morgan of Reed College on "Chemistry and the War," the members and their guests participated in a dance, during which refreshments were served.

Professor Morgan said in part that during three years the output of chemicals in the United States has increased from six million pounds to 1,250 million, exclusive of explosives. Dye stuffs have increased since 1913 from 333 million pounds to 1,200 million pounds, or 80 per cent of all used. After the first gas attack of the Germans, the English furnished a million gas masks to their troops in the space of four days, and England now is spending \$125,000 per day for chemists to work on gas and flame chemicals. Nitrogen can not be obtained in the United States for one-fourth what it costs the Germans to manufacture it. Potash is the most difficult problem, however, and has not been solved for the Allies. Only about 25 per cent of the demand has been produced, Germany controlling the world's only natural supply. Among the substitutes which the war has called forth, a new alloy of magnesium and aluminum has been developed in Germany to take the place of copper. Germany's greatest remaining need is fats. The only vegetable that will grow in Germany from which oil can be obtained is sunflowers, and they are planting an immense amount of this flower. They are is made into a substitute for rubber. Nettles, willow bark,

and paper are used in making cloth. Chemistry has done more to keep life in people than the use of explosives has killed. Without disinfectants, for instance, modern surgery would be impossible. There would, in fact, be no civilization on earth today were not for chemistry.

About 50 couples attended the lecture and party.

Alameda County Electrical Club

The Alameda County Electrical Club held its election at the last regular meeting at Hotel Oakland.

George Drew of the Pacific States Electric Company was elected president, Lee Gilpin of the Piedmont Electric Company vice-president, and George B. Furmiss of the Pacific Gas and Electric Company secretary-treasurer.

The retiring officers were given a vote of thanks for their work during the past year, and George Drew gave a very interesting talk on past activities and asked that the boys get together and make this the banner year. In order to obtain greater co-operation among the electrical men a committee was appointed to confer with the Electrical Contractors and Dealers. It is hoped that the next meeting of the club, which is to be held on February 21st, will be largely attended by electrical men from both sides of the bay. Some prominent speaker will be present and an interesting program will be held.

HAPPENINGS IN THE INDUSTRY

Changes and Beginnings

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a service station at 535 First Avenue South, Seattle, from which to handle service in the State of Washington and the Northwest. It announces, also, the removal of its Seattle sales office to the location given herein, to continue in charge of C. Kirk Hillman.

The C. A. Smith Company of Marshfield, Ore., is finishing the foundations and preliminary work for installing electric equipment which will double their present output.

The machinery for the second unit of the plant, costing about \$80,000, has been enroute here from Schenectady, N. Y., since the latter part of December and the several cars containing it should arrive any day.

New Power Loads

Colorado Power Company reports that power contracts signed up in 1917 aggregated 10,497 horsepower with an estimated annual revenue of \$350,912. The net gain in new business for the year was 7,024 horsepower with an estimated annual revenue of \$242,235. On December 31 new business under contract not yet connected, aggregated 4,130 horsepower with estimated annual earnings of \$152,400. According to the company's estimates, this business will all become productive of revenue by the end of September, 1918.

The large government spruce cut-up plant was opened in Vancouver, Wash., recently. It is the largest plant of its kind in the world and will furnish much of the spruce which will go to make America's fleet of aeroplanes.

New Business

McDonnell & Company of San Francisco, Cal., are distributing a circular dealing with the Poulsen Wireless Corporation. The patent originally introduced in this country from Denmark has been amplified by L. F. Fuller. The system has been adopted by the United States government at Cavite, Philippine Islands, for a plant nearing completion. The French government has closed a contract with the corporation for what is described as the most powerful wireless installation in the world.

The Electric Sales Corporation, Henry building, Seattle, has secured exclusive manufacturing and selling rights for the Lindberg Electric moisture vaporizer for eliminating the

"freezing" of pneumatic tools, such as riveting machines, pneumatic drills and other tools. It is estimated that the installation of the Lindberg vaporizers will save thousands of dollars to the shipyards.

William A. Mullins Electric Company, 931 Broadway, Tacoma, has the contract for installing Brascolite fixtures in the billiard room at Camp Lewis. This is said to be the largest billiard room in the United States.

The Northwest Electric Company, 760 Commerce street, Tacoma, Washington, H. F. DeWeese, manager, reports much activity. The company has completed the wiring in the 1800 buildings at Camp Lewis with the exception of the Y. M. C. A. buildings, the Cassidy & McKee buildings and the theatre building. It also did the complete wiring in the Lynn undertaking parlors on Tacoma avenue, building of the Griffith Motor Car Company on Broadway and the plant of the Tacoma Shipbuilding Company.

A. H. Cox & Company, 307 First Avenue South, Seattle, are installing a unique equipment for the United Coal Sales Company at Railroad Way and Florida street. The purpose is to operate 60 horsepower traveling hoist by a trolley system which must be kept within a maximum of 14 inches from the dock. As there was no chance to get under the dock, a rather odd system consisting of heavy wooden screws to protect the trolley system from the water and to guard against personal injury was installed.

Personal Items

Stephen M. Cronk, Seattle manager Otis Elevator Co., reports the closing of contracts with Hans Pederson, general contractor, for the sheet metal shop No. 102 at Bremerton navy yard, to install an electric freight elevator by March 15th. He has also contracted to install a hydraulic elevator in the temporary store house now being erected by Erickson & Larson, same to be ready by March 1.

H. H. Manny, manager of the Seattle office Baker-Joslyn Company, 526 First Avenue South, announces that the company has taken on the complete line of conduit and marine fittings of the V. V. Fittings Company of Philadelphia and now represents this concern on the Pacific coast.

J. C. Manchester is now district sales manager for the Economy Fuse & Manufacturing Company, San Francisco.

Mr. Manchester was formerly connected with the Interstate Electric Novelty Company in that city.

A. B. Hill was recently reelected president of the Petaluma Power & Water Company; Thomas Maclay as vice-president; F. D. Ellsworth as secretary and superintendent, and the Petaluma Swiss-American Bank as treasurer.

J. A. Hoskins of Baker, Ore., recently was awarded the contract for the construction of the drainage system on the Ontario drainage project at a figure approximating \$150,000. In company with L. R. Stockman, of this city, consulting engineer on the project, he will go to Ontario next week to arrange for beginning work.

Robert Bailey has purchased the Morton Telephone Company. He is to make immediate repairs and rebuild the plant almost entirely in the spring.

Reclamation Heads Meet

Managers of the 32 reclamation projects under government control met recently in Denver for an annual conference with A. P. Davis, Director of the reclamation service, and other service officials. Increased food production through bringing into cultivation lands on the projects for which water now is available, conservation of water, improved distribution systems and general irrigation and drainage problems made up the program. Virtually every western state was represented at the meeting.

Olympia Gets New Rates

The Olympia Light & Power Company, Olympia, Washington, has filed with the state public service commission a new rate schedule, increasing the rate to be charged but lowering the present combination rate for residence lighting, heating and cooking with electricity. The intended schedule of rates increases the maximum charges to power users from 50 cents to \$1 and raises the rate to be charged by approximately 20 per cent. This will have its effect on the shipyards, iron works, printing plants and other users of electric motors. Present residence lighting is unchanged but the new combination rate for lighting, heating and cooking by electricity is to be 12 cents for the first four kilowatt hours, eight cents for the following 12 and three cents for all after that.

Household Electrical Appliances to be Standardized

The national movement for the conservation of time, labor, food and fuel is adding an impetus to the already exceptional demand for household electrical appliances.

To more rapidly popularize these appliances, the Edison Electric Appliance Company, recently merged from the General Electric Company (appliance department), Hughes Manufacturing Company and the Hotpoint Electric Heating Company, has organized a development committee.

This committee, which is composed of the best electric heating talent of the three companies, will operate at the various plants of the Edison Electric Appliance Company during 1918, beginning its work at the Ontario, Calif., plant and continuing its investigations there until February 15th.

It will be the work of this committee to discard the undesirable and retain the desirable points developed in the practice of these three companies, blending with their work the ideas received from the trade in regard to the requirements of the buying public.

To further this work, the development committee invites the co-operation of the men in the field who are selling and installing these appliances. It wants suggestions and criticisms naturally born of experience with the buying public. Most particularly it wants to know the needs mechanical and electrical, from a selling standpoint, and what the user wants in the way of utility and appearance.

With the full co-operation of the trade, it is fair to prophesy that the near future will see a rapid development in the electric appliance industry.

Readers of the Journal who will co-operate in this work should communicate with C. P. Randolph, who is chairman of the development committee, at 5660 Taylor street, Chicago.

Traction Club Meeting

The Stone & Webster Club held its mid-winter meeting and dinner in the Labor Temple Annex, Seattle, on the evening of January 30. One hundred and sixty members were in attendance. President Alton W. Leonard; Vice-president William J. McGrath of the Puget Sound Traction Light & Power Company; Manager L. B. Dean of the Tacoma Railway & Power Company; Manager Donald S. Barnes of the Everett Railway & Power Company, with Fred S. Pratt, chairman of the Board of Directors of the Puget Sound Traction Light & Power Company were in attendance as guests. George E. Quinan, engineer of the company and president of the club, presided.

NEW BULLETINS

Trade Catalogues

The Ductometer, a chart for use in connection with ventilating systems, is the subject of a brief bulletin recently gotten out by R. D. Ward and Geo. P. Bender of New York.

An attractive bulletin recently published by the Trumbull Electric Manufacturing Co. lists and describes their various types of enclosed switches.

Brascolite Catalogue



Not only does the new Brascolite catalogue describe Brascolites, but it also tells about certain of the other Luminous Unit Co. products, namely, Industrolites, their factory fixture; the Projectolite, a flood-lighting unit, and the Aglite glass products. The white porcelain enameled switch plates are of particular interest. The rear of the booklet is devoted to a code which may be used in transacting business with the company by telegraph. A diagram for determining spacing or

mounting height of Brascolite fixtures when either factor is known, has also been included.

The Upbuilding of the Industry

The National Electrical Safety Code (Circular No. 54) issued by the United States Bureau of Standards, Washington, D. C., covers all points relative to the safety of human life in the various classes of electrical construction.

A thirty-two page booklet covering general construction safety orders, effective January 15, 1918, has recently been issued by the Industrial Accident Commission of California.

The annual report of the Chief of the Bureau of Foreign and Domestic Commerce for the year ending June 30, 1917, has just been given out. Two investigations in the field of electrical equipment, machinery, and supplies were conducted during the year. The men appointed for this work were P. S. Smith, formerly in the export department of one of the largest electrical companies, whose investigation of Latin American markets started in the previous fiscal year, and R. A. Lundquist, well known as an engineer and writer on power transmission and other technical subjects, who reported in August, 1916, for Far Eastern work. The far eastern investigation covers power-generating equipment, transmission and distribution materials and equipment, motors and control equipment, electric railway equipment and electric locomotives, combined power plants, meters, lamps, batteries and battery plants, telephone and telegraph equipment, wiring supplies and electric fixtures, electric ranges and other heating appliances, medical and dental apparatus, and various miscellaneous apparatus.

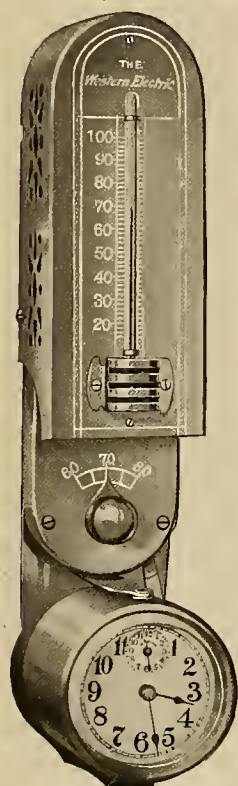
LATEST IN EVERYTHING ELECTRICAL

(The possibilities of mechanical heat regulation have tempted experimentation, so that at one time or another many devices for governing temperature changes have been placed on the market. A new instrument, adjustable for use with hot air, steam or hot water furnaces, has recently been gotten out and may be used either with dry batteries or directly connected to the house wiring. An ingenious "new wrinkle" tap is further described and notice is made of the government need for skilled workers.—The Editor.)

Heat Regulator

A new heat regulator gotten out by the Western Electric Company will maintain an even temperature in the house, thus adding to the convenience and health of the household. It prevents the overheating of the furnace and the wasting of fuel. It permits the maintaining of a comparatively low temperature at night; and at a predetermined hour in the morning will automatically open the drafts and the awakening household will find a comfortably warm house. There is no danger of the house being overheated. A thermostat is mounted on the wall on the first floor. Connected to this is a cable running to a motor in the basement. A change of the room temperature on the first floor of one degree causes an electrical impulse to be sent to the motor box and the drafts will be opened or closed as required. It replaces the human element in heat regulation. It will regulate the underfeed draft and the check damper of either hot air, steam or hot water furnaces. It can also be applied so as to govern the main valve on gas, municipal or community steam heating plants.

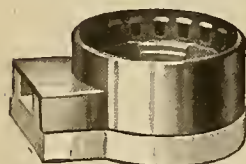
For the home that is not wired there is the No. 100 type. Two cells of dry batteries furnish the current for the electrical impulse from the thermostat to the motor box. The motive power for operating the drafts and dampers is furnished by a substantial spring motor.



Recording dial of the regulator

A Novel Canopy Tap

The Bryant Electric Company of Bridgeport, Conn., have added to their "New Wrinkle" line of wiring devices a novel canopy tap of wide application which can be readily attached to any ceiling or side wall fixture where a current tap is desired.



A "new wrinkle"

The new tap receives any "New Wrinkle" body and many useful combinations can be made. For instance, by wiring across the line and using in conjunction with a "New Wrinkle" Keyless, keyed or pull chain socket, an additional outlet is provided for an Edison plug flexible cord attachment to a fan, portable lamp or other device; or any additional "Spartan" outlet can be provided by using the canopy tap and a "Spartan" 29 plug receptacle.

The new device which is known as the "BZ New Wrinkle Canopy Tap," is National Electrical Code Standard and consists of a "New Wrinkle" ring and a porcelain base which are easily and firmly attached to the outlet box by means of a stamped steel ring, rings being made to fit $3\frac{1}{4}$ inch and 4 inch boxes. In lath and plaster construction, the rings are

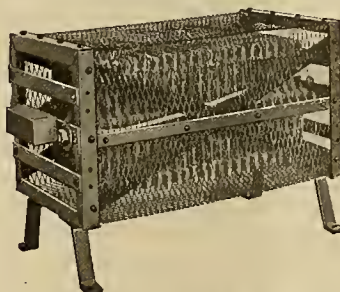


Combined with a pull switch

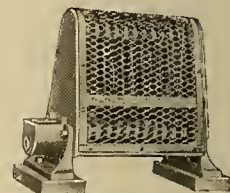
omitted and the base attached by wood screws. After notching the canopy to fit over the neck of the tap it can then be replaced flush with the ceiling or wall, resulting in a neat and unobtrusive job.

Electric Air Heaters

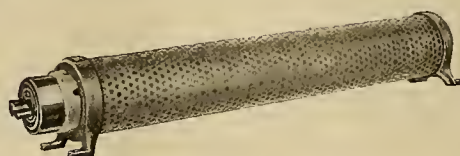
C-H Electric Air Heaters are designed to supplement the furnace or steam heating system in the home, office, factory or large industrial plant.



Grid type Mill Heater 5 K. W., widely used where heat "without frills" is desired



1 K. W. Open Coil type heater—small and neat—easily portable.



1 K. W. "H" Unit type heater takes little space—can be operated at three heats

In the home or office electric heaters are particularly useful in the raw days of late fall or early spring, when the main heating plant is not in operation and in such uses they affect a distinct saving in coal. They can be used to advantage in the winter time to make more comfortable a room that is hard to heat.

Large industrial plants and factories find electric air heaters useful in heating crane cabs, outhouses, valve, pump and meter houses, exposed remote corners or rooms, watch or signal towers, for shearmen and tablemen in steel plants in theatre ticket booths as well as for scores of miscellaneous applications. Flexible electrical conductors will carry electrical heat cheaply and efficiently to the most inaccessible points.

The "H" unit type consists of standard C-H Space Heater Units each about the size of a two foot rule. The units are mounted horizontally with the flat side in a vertical position in order to give the best circulation when the heater is used on either wall or floor.

The Open Coil Type built to meet the rigid specifications of the United States Navy and used extensively on board ship has the resistor wound in the form of an open coil over asbestos cord on porcelain supports. This type and the "H" unit type are both handsomely finished and are particularly designed for use in the home or office.

The Grid or Mill type consisting of standard grid is designed for industrial use where heating "without frills" is desired.

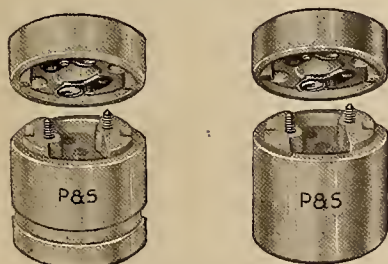
New V. V. Type "R" Receptacles, Plugs and Boxes

A new heavy service receptacle mounted in a neatly finished cast iron box was recently placed on the market by the V. V. Fittings Company, Philadelphia. The box is weatherproof, arranged with a gravity closing lid which remains closed whether the plug is in or out. The receptacle is made of heavy slate thoroughly insulated from the box. The receptacle sets at an angle in order to permit an easy connection and disconnection of the plug. The binding posts for connecting wires are easily accessible and plenty of room is allowed for wiring. The plug is made of wood so as to stand rough handling and is arranged so that the polarity cannot be reversed.

The complete outfit is made in 2, 3 and 4 pole for 30 and 60 ampere capacities. It is made especially for outdoor work for use with portable motors, coal hoists, shipyards, boat loading machinery, moving picture machine outlets, etc.

Two-Piece Porcelain Sockets for Reflectors

P&S 1233, a two-piece porcelain socket without shade-holder groove, and its companion piece, P&S 1234 with shade-holder groove are placed on the market by Pass & Seymour, Inc., to meet the requirements for heavy-duty sockets for medium or normal-base type "C" lamp fixtures. These receptacles have ample wiring room or clearance for a single



Porcelain sockets for reflectors

or double pair of wires in the terminal hood which may be supported by substantial machine screws, spaced 1 3/16 inch on centers.

These receptacles are entirely front-connected and the socket-body is easily positioned by the aid of heavy porcelain tenons.

All live parts, where necessary, are sealed in with a special compound which will successfully resist the extreme temperature to which the devices may be subjected in use.

MISCELLANEOUS NOTES

On Fuel Saving

Southern Pacific engineers are in receipt of pledge cards from United States Federal Fuel Administrator for California Albert E. Swabacher calling on them to save fuel. The Southern Pacific is the greatest consumer of fuel oil in the state and the co-operation of its employees is expected to mean in the aggregate a vast saving for other industries. Following are the contents of the pledge card:

1. Keep on time. It is more economical to keep up than to catch up.
2. Make no unnecessary stops.
3. Take water as quickly as possible.
4. Watch fuel performance on each trip and report excessive consumption.
5. Co-operate to the fullest extent with the other man in the cab, dispatchers and train crew.
6. See that no oil is wasted when filling tank of engine.
7. Report promptly any waste of oil that you may notice in connection with your work or otherwise.
8. All work in connection with the pledge cards to the engineers and firemen has been under the direct supervision of Walter J. Samson, chairman of the Conservation Committee for the Federal Fuel Administration for California.

Shipyards Workers Wanted

Among the 79 occupations that are employing men needed for ship and machine work during the war are: Mechanical draftsman, electrician, electrical wireman, electric welder and power engineer. All individuals skilled in one or more of these branches are asked to enroll in the United States Shipyard Volunteers of the Public Service Reserve. Blanks giving questions that must be answered may be obtained from the chairman of the County Council of Defense.

Call for Electricians

Three hundred men are wanted for the 37th Engineers. The work of the unit will be to furnish electricity to the troops in France. Every man must be an expert in his line.

California Water Commission Applications

The Sespe Light & Power Company of Los Angeles has applied to the State Water Commission for permission to appropriate 60,000 acre feet of the waters of Piru Creek, tributary to the Santa Clara River in Ventura county for irrigation purposes. The only works specified in the application is a main canal 18 miles in length. Six months has been asked in which to complete the application.

Two separate applications have been filed with the State Water Commission by the Southern California Edison Company in connection with the development of its power projects. One application involves the impounding of the waters of Pitman Creek in Fresno county and the other the waters of Salmon and Horse Creeks in Tulare county. It is proposed to store the waters of Pitman Creek and divert a portion of same to Big Basin Reservoir, on Big Creek, and the remainder directly into conduits leading to power plants below. The estimated cost of the dam and the conduit line to Big Basin Reservoir is stated at \$842,900. In connection with this application, the Southern California Edison Company is successor to the appropriations of water and the property of the Pacific Light & Power Corporation. Two plants have been already installed on Big Creek, known as Big Creek Power Plants Nos. 1 and 2, and the company proposes to construct two additional plants below these. The water after use in the four plants is to be returned to the San Joaquin River from the tail-race of Plant No. 4 in Madera county. The application sets forth that the company has already expended \$16,525,750 in its Big Creek and Pitman Creek project, including the cost of a high tension transmission line from plants Nos. 1 and 2 to the city of Los Angeles. The Forest Service in its permits to this company has set 1930 as the time limit in which the project must be completed.

NEW ELECTRICAL DEVELOPMENTS

(Increasing loads in the Northwest as the result of growing industrial demands mark the past two weeks in the electrical world. Applications for the development of 131,000 horsepower on the Deschutes River and other new enterprises share interest with the progress in Seattle's municipal plans. Further use of power for irrigation purposes, new shipbuilding loads, and considerable extension in the electric railway field are characteristic of activities farther down the coast.—The Editor.)

THE PACIFIC NORTHWEST

OLYMPIA, WASH.—The Olympia Light & Power Company is installing a new 400 kw. alternating current generator in its power plant.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has permit for the erection of a \$75,000 coal burning plant at 1315 Western avenue.

PROSSER, WASH.—The Prosser Irrigation District is making active preparations to begin work on the pumping plant. The district comprises about 2000 acres north of town.

ELLENSBURG, WASH.—Henry G. Mills and associates have requested of the county commissioners a 50-year franchise for constructing an electric line over some of the county highways.

WINLOCK, WASH.—The Toledo, Vader, Winlock and Napavine franchise held by the Independent Electric Company, has been transferred to the Idaho-Washington Water, Light & Power Company.

SHELTON, WASH.—The commissioners of Mason county have granted the Shelton Light & Power Company a franchise to erect and operate electric transmission lines over the highways of Mason county.

TACOMA, WASH.—It is intimated by city officials that the municipal street car line will be double tracked from the east end of the viaduct to the Todd shipbuilding plant to relieve traffic congestion.

SALEM, ORE.—H. S. McGowan, of McGowan, Wash., has made filings on water rights in the Deschutes River in this state which, under the application, call for development of 131,000 horsepower at a cost of \$6,000,000.

SEATTLE, WASH.—Specifications submitted by J. D. Ross, superintendent of lighting, for incandescent lamps for the year 1918, have been approved by the Board of Public Works. Approximately 500,000 lamps will be purchased this year.

TACOMA, WASH.—City has awarded a contract to the American Nitrogen Products Company, Securities Building, Seattle, for furnishing to it 6600 volts of electricity for a period of five years on a sliding scale of from \$6 to \$10 per kilowatt year.

VANCOUVER, B. C.—The Pacific Coast Pipe Company of Vancouver has received a contract to provide a mile and a quarter of 13 and 13½-inch wood stave pipe for the Ontario Power Company. The power company is going to spend \$1,800,000 on additions to its plant.

SPOKANE, WASH.—By a contract closed between the Washington Water Power Company and the Stevens County Light & Power Company, a power line, approximately 40 miles long, will be built to furnish power for development of natural resources in the southern part of Stevens county.

MARSHFIELD, ORE.—The Oregon Power Company has closed a five-year contract with the city of North Bend covering street lighting and a system of series incandescent lighting will be installed. The company is at present extending its lines in Coquille to serve the Sitka Spruce Company to the extent of 150 horsepower in motors.

PORT ANGELES, WASH.—The Paraffine Companies, Inc., of Port Angeles, which are constructing the Crescent Card factory at a cost of \$200,000, have announced that the plant will be operated entirely by electricity, supplied by the Washington Power & Manufacturing Company from its plant

located on the Elwha River, seven miles from Port Angeles.

SALEM, ORE.—Two big applications for power development on the Deschutes river for manufacturing and general uses were filed with the state engineer recently by H. S. McGowan, of McGowan, Wash., who is identified with P. J. McGowan & Sons, large salmon packers. Power plants are to be constructed at an estimated cost of \$6,000,000, according to the applications.

SEATTLE, WASH.—Immediate construction of a third unit of the Lake Union power plant at an estimated cost of \$600,000 is recommended by Mayor H. C. Gill, in a letter to the city council. The second unit, for which \$390,000 was authorized, is nearing completion, and he recommends that steps be taken without delay to obtain priority rights on the needed machinery and turbines for the third unit.

GOLD HILL, ORE.—W. A. Sharp of Grants Pass, and his brother, L. C. Sharp of Plattsmouth, Neb., have purchased the placer mining property known as the Hydraulic Mining Company's mine, on Upper Jump-off-Joe Creek, in the north end of Jackson county. It is the intention of the Sharp Brothers to make extensive improvements on the property at once, and to install hydro-electric precipitating value-recovering machinery.

SEATTLE, WASH.—It has been decided to enlarge the scope of the bids to be received for extension of the city's power facilities. The Council some time ago passed an ordinance calling for bids for development of the lower Skagit River project. According to report of City Engineer Dimock, he has investigated the offer of the Skykomish Power Company to sell the city a site on the south fork of the Stillaguamish River, and finds that it is feasible to develop from 30,000 to 40,000 horsepower on this site, and that if the Skagit River power site should not be acquired, the Stillaguamish site is worth investigating.

PASCO, WASH.—The city council passed a resolution directing the city engineer to prepare plans, specifications and estimates of cost of a municipal water system to include the present system of the Pacific Power & Light Company, the distribution system now owned by the city, and extensions and betterments of both systems, sufficient to supply water for all purposes, with estimates of cost of operation. It is planned to acquire the pumping plant on Snake River, formerly used by the Pasco Reclamation Company, together with all its pipe lines and laterals. In addition to this plant it is planned to install an additional plant on the Columbia River west of Pasco.

SEATTLE, WASH.—To avoid the expenditure of current revenues of the city lighting department for extension work, Superintendent of Lighting J. D. Ross is expected to ask the council to authorize the issuance of \$1,000,000 light fund utility bonds to take up the \$675,000 of light fund warrants outstanding, and provide an extension fund. In addition to this issue, Mr. Ross would also authorize and offer for sale in \$50 denominations, \$500,000 or more of the same securities, depending on citizens to buy the securities. This fund would also be issued for extension purposes and both issues would be in addition to the \$5,000,000 issue authorized for the purchase of a completed hydro-electric plant, bids for which will be opened by the Board of Public Works on March 1st.

SEATTLE, WASH.—J. D. Ross, superintendent of lighting, has made formal application in the name of the city for

a preliminary report from the Department of Agriculture for development of a power project at Ruby Creek Canyon on the Skagit River, together with all the storage not contemplated in a previous Diablo Canyon filing. He has also submitted to the State of Washington the letter of priority from the Secretary of Agriculture, giving the city the right to occupy federal lands for a 25,000 kilowatt plant, and filed with the state an application for a permit to store and use the entire waters of the Skagit River at a point at the mouth of Ruby Creek. The Skagit Power Company had a permit from the state for all water rights on the Skagit River, and the application made by the superintendent of lighting anticipates a similar revocation to that made by the Department of Agriculture.

PACIFIC CENTRAL DISTRICT

DURHAM, CAL.—The Durham Light & Power Company is contemplating the installation of a distribution system in about 60 days.

AUBURN, CAL.—The property owners along Central Square have taken steps toward installing an electrolier lighting system.

SAN FRANCISCO, CAL.—The Twin Peaks tunnel has been opened and cars of the Municipal Railway are running on regular schedule.

STOCKTON, CAL.—The Western Gas & Electric Company is asking permission to increase its rates in Humboldt and Trinity counties.

QUINCY, CAL.—The Quincy Electric Light & Power Company is contemplating the purchase of an engine before the next low-water period, to be used as an auxiliary to water power.

CHICO, CAL.—W. M. Gribble of the Western Gas & Electric Appliance Company, was awarded the contract to install the electrical system in the Hotel Oaks, now under construction.

EUREKA, CAL.—Western States Gas & Electric Company will supply power for the work of salvaging the cruiser "Milwaukee" in Humboldt Bay. The city council has renewed the city street lighting contract.

SAN FRANCISCO, CAL.—The Asher Electrical Company, 607 Howard street, have been awarded the contract to install the street lighting system and the interior wiring of the barrack buildings at Angel Island.

REDDING, CAL.—The city trustees are contemplating the purchase of the Northern California Power Company's plant for a municipal lighting system. The company has been asked to name a price for the system.

MARTINEZ, CAL.—Plans have been perfected for the formation of a company to operate an electric railway between Martinez and Bay Point, where the big shipbuilding plant is to be located. The distance is but five miles.

SACRAMENTO, CAL.—C. H. Slocum and R. A. Rose have petitioned the county supervisors for a 50-year franchise to construct and operate an electrical power line through Sacramento. The petition was taken under advisement.

SAN FRANCISCO, CAL.—The Board of Public Works awarded the contract for furnishing electric motors to the Lower Cherry River Development, Contract No. 31, Hetch Hetchy Water Supply, to the Allis-Chalmers Manufacturing Company for the sum of \$9200.

OROVILLE, CAL.—Twelve thousand more acres of land in this section of Butte county will be under irrigation in a short time. Contracts have been signed by land owners east of Biggs with the Sutter-Butte Canal Company. The water will be pumped with large electric pumps.

STOCKTON, CAL.—The Tidewater Southern Railway Company, now operating between Stockton and Hilmar, via Turlock, is preparing to extend its lines to Livingston, ten miles south of that city, where it will tap one of the richest agricultural sections in the San Joaquin Valley. Preparations for changing from steam to electric power are also being made.

ST. HELENA, CAL.—Trustees and the Fire and Water Committee reported having a conference with the Napa Valley Electric Company regarding cutting down the number of lights. This could be done by cutting out the top lights on the electroliers from Madrona avenue to York Creek. The clerk was instructed to advertise for bids according to a schedule to the prepared by the committee.

RICHMOND, CAL.—The Western States Company has secured a five-year contract covering the electric light and power requirements of the Santa Fe Company at Richmond and power for pumping at San Pablo, representing a total connected load of approximately 700 horsepower. The company will supply electric energy to the American Dredging Company under a dredging contract received from the City of Richmond.

EUREKA, CAL.—The 10,000 volt line of the Western States Gas & Electric Company has been extended from the Hammond shipyard to the sawmill, where the company is setting three 100 kilowatt transformers and furnishing auxiliary power. This extension will also permit the company to connect directly with the 2300 volt line running from the Hammond sawmill to the cruiser Milwaukee, where electric energy will be supplied in salvaging the cruiser.

PACIFIC SOUTHWEST

RIVERSIDE, CAL.—City power lines will shortly be extended to the municipal rock crusher at the end of Central avenue.

SAN DIEGO, CAL.—The United States Government is planning the expenditure of \$50,000 at the Chollas Height wireless station.

ORANGE, CAL.—The directors and lighting committee of the Olive Improvement Association met to consider plans for the formation of Olive lighting district.

SPRINGER, N. M.—The Springer electric light plant, owned by J. S. Bowman, will install an alternating current generator to replace the direct current machinery that has been in use.

SAN FERNANDO VALLEY, CAL.—The State Railroad Commission has before it an application from the Pacific Telephone & Telegraph Company to purchase the San Fernando Valley Home Telephone Company.

LOMPOC, CAL.—The Continental Securities Company, which controls the Lompoc Light & Power Company, has submitted a proposal to the Board of City Trustees offering to sell the property to the city for \$30,000.

SAN DIEGO, CAL.—Petition has been filed with the clerk of the Board of Supervisors applying for the formation of a public highway lighting district to be known as the Sierra Vista Public Highway Lighting District.

SAN DIEGO, CAL.—Construction of buildings for a marine base here is expected to start not later than September 1st. More than \$1,250,000 is available for buildings and installation of sewerage, water and lighting systems.

LIBERTY, ARIZ.—The mining company at Liberty, it is reported, contemplates the installation of electric lighting, water and sewer systems for the proposed town near the mine. Lescher & Kibbey of Phoenix are engineers.

WOODLAND, CAL.—Contract for furnishing and installing electric fixtures in courthouse has been awarded to Roberts Manufacturing Company, San Francisco, for \$11,300. The Thomas Day Company bid \$12,250, and L. J. Meyberg \$12,630.

MAGDALENA, N. M.—Erection of a power plant, it is said, will be first work to be undertaken by the Magdalena Coal Company and the Southwestern Power & Coal Company, so that they may furnish electricity to the people of Gallup and vicinity.

DOUGLAS, ARIZ.—Douglas Traction & Light Company has started grading through Pirtleville for extension of its line. It is stated by General Manager R. G. Arthur that work

will be pushed and that cars should be running through Pirtleville early next spring.

BREA, CAL.—The city of Brea has signed a new contract for street lights under which the present system is to be changed from 32 candlepower bracket lights to 40 candlepower center suspension units. Provision is also made for additional lights in the future.

SAN BERNARDINO, CAL.—The construction of a new hydro-electric power plant in Little Bear Valley is under consideration by the Arrowhead Reservoir & Power Company. The plans provide for an initial development of 12,000 horsepower, to cost about \$2,000,000.

LOS ANGELES, CAL.—Application for franchise has been made to the Board of Supervisors by the California Edison Company for a pole and wire system to distribute electrical energy covering the entire county. The company asks for a franchise for a term of 40 years.

LOS ANGELES, CAL.—In return for allowing the Los Angeles Railway Company to abandon its portion of the East Fourteenth Tennessee street carline, the Public Utilities Committee proposes that the company extend its W. Jefferson street line from Third avenue to Ninth avenue.

MANHATTAN, CAL.—A resolution has been adopted by the Board of Trustees for the improvement of a portion of Highland avenue between the southerly city boundary line and the southerly line of Fifteenth street, by the installation of sixteen reinforced concrete ornamental lighting posts, conduits and wiring.

BISBEE, ARIZ.—The sum of \$31,000, appropriated by Mountain States Telephone & Telegraph Company some months ago for improvement in Warren District, will be spent this year, it is stated by the commercial representatives of the company. Improvements are to be very extensive, including inside and outside work.

LOS ANGELES, CAL.—When the Board of Public Works took under consideration bids submitted for installation of the new lighting system on Broadway, it developed that the fund on hand is approximately \$6000 less than the lowest bid received. To provide the remainder of the amount needed, it is suggested that the city sell the 135 posts that are now on Broadway.

BISBEE, ARIZ.—California capitalists, who at recent land sales in Tucson purchased 27,000 acres of land south-east of the city, will start shortly to sink a number of test wells on 10,000 acres of the land. It is planned to divide the land into eight-acre tracts and colonize the same. Individual well and pumping plants will be provided for each tract if the water supply proves to be adequate.

OCEANSIDE, CAL.—Sale of property of the Recreation Club at Third and Tremont streets to the San Diego Consolidated Gas & Electric Company has been completed. The company will move its Oceanside plant and offices to the new location soon. In a few weeks connection will be made with lines of the Edison Company at Capistrano and the electricity used in this section will be generated by water power in the mountains of the Sierra Nevadas.

PHOENIX, ARIZ.—James B. Girand has resigned as city engineer of Phoenix to devote his time to the development of a big hydro-electric project in the Grand Canyon. Eastern capitalists are interested in the project. The project involves the construction of a dam in the Colorado river near Diamond creek, and the installation of high pressure turbine engines. Permits have been secured for the erection of six dams, but only one will be constructed at the present time. The project calls for an outlay of about \$12,000,000.

THE INTER-MOUNTAIN DISTRICT

CASPAR, WYO.—The power house of the Natrona County Electric Company is reported to have been burned with a loss of \$150,000.

BONNERS FERRY, IDAHO—The Bonner Water & Light Company contemplates the installation of a Rumsey triplex 375-gal. per minute pump.

BOZEMAN, MONT.—The lighting plant is not to be rebuilt, as was reported recently, according to W. A. Livingston, of the Bozeman Branch of the Montana Power Company.

BOISE, IDAHO—The City Council will be asked to go over the plan of the new lighting system for the city, which, it is estimated, will save the city a bill of at least \$5000 annually for lights.

SWEETGRASS, MONT.—The Toole County Telephone Company has filed articles of incorporation, through Kenneth G. Luke and others, capital stock \$50,000. A line is to be constructed between Shelby and this place.

KALISPELL, MONT.—Farm power business is a growing part of the service of the Northern Idaho and Montana Power Company's Kalispell division. Farmers and ranchers in that district are continually making applications for electric service.

BOVILL, IDAHO—Bonds to the amount of \$5,500 have been voted for the installation of a municipal electric-lighting plant. The proposed plant will be installed in the pumping station, in which an engine and other necessary equipment will be placed.

LOVELOCK, NEV.—Surveying has been done and the contracts let for the construction of a telephone line to serve the lower valley by the Golconda Telephone Company. Another telephone circuit for the upper valley is being put in by the same company.

SALT LAKE CITY, UTAH—Increasing use of electricity to lift water to lands above the gravity supply is reported from the Strawberry Valley project. The valley is almost wholly agricultural, but has not as yet developed more than half its available land.

LOVELOCK, NEV.—The Nevada Valleys Power Company has taken over the operation of the electric light and power plant at Battle Mountain. Among the plans announced by the company are the installation of new engines and equipment with enlarged capacity.

DENVER, COLO.—Chemical Products Company, Louisiana and South Jason streets, was visited by fire January 14, of incendiary origin. The loss is estimated at between \$50,000 and \$75,000. The company has been producing vanadium on sub-contracts for the British government. The plant will be rebuilt immediately to discharge contracts.

WOLF POINT, MONT.—J. E. Galehouse of Carrington, and C. B. Aasness of Bismarck, N. D., have bought the electric light plant here. Messrs. Aasness and Galehouse were partners in the light plant at Carrington for several years, selling it to the Central Utilities Corporation. The transaction is said to have involved between \$75,000 and \$100,000.

MONTICELLO, UTAH—The Blue Mountain Irrigation Company, Monticello, amended its articles of incorporation, increasing the capital stock from \$15,000 to \$60,000, and enlarging the scope of business authorized so as to include the development and sale of electric power. The amendments also make changes with regard to the election of directors. F. I. Jones is president and A. B. Barton secretary.

SALT LAKE CITY, UTAH—An agreement subject to the approval of the State Public Utilities Commission is to be entered into between the Commissioners of Salt Lake County, the Utah Power & Light Company, and the Progress Company for lighting the public roads and streets of the county with electricity for a period of 20 years. Under the terms of the contract the company is to furnish a minimum of 400 lamps.

SALT LAKE CITY, UTAH—An addition of 11,270 horsepower will be made to the commercial electrical energy to be supplied to Salt Lake City and vicinity in the immediate future. This added electrical power is to be developed on the west and north forks of the Duchesne River, near Stockman, and is to be brought to Salt Lake City by means of high-tension copper transmission lines running west across the western part of Duchesne and all of Wasatch counties.

JOURNAL OF ELECTRICITY

VOL. 40 NO. 5

SAN FRANCISCO, MARCH 1, 1918

PER COPY, 25 CENTS

D



OWN by the mighty Monterey cypress overlooking the vast Pacific, there is going to be a convention of historic value April 24-27, 1918. The halls and committee rooms of the classic Del Monte Hotel are even now being set in order, papers are being prepared in many sections, and earnest men and women throughout the West are looking forward to the holding of this War Service Convention of the Pacific Coast Section, N. E. L. A. that will go down in tradition as a gathering in full keeping with the spirit of the times.

The discussions will be extremely helpful and will serve to draw electrical men into closer, more effective working relationship at a time when never before existed a greater need for co-operative helpfulness.

You can't afford to miss this one great expressive convention of the year where jobber, contractor-dealer and central station man will meet. Watch for additional particulars in succeeding issues of the Journal of Electricity.

TENTATIVE PROGRAM

April 23—
10:00 p. m.—Special train leaves Los Angeles.

April 24—
8:00 a. m.—Special Train leaves San Francisco.

2:30 p. m.—Convention Called to Order—General Session.

8:30 p. m.—Convention—Social Session.

April 25—
9:00 a. m.—Engineering — War Session.

5:00 p. m.—End of Engineering War Session.

8:30 p. m.—War Service Ideals for Electrical Industry.

April 26—
9:00 a. m.—Commercial Section — War Session.

4:00 p. m.—End of Commercial Section—War Session.

4:00 p. m.—General Session — Election of Officers.

5:30 p. m.—Close of Formal Convention.

7:00 p. m.—Grand War Service Banquet.

April 27—
9:00 a. m.—Field Sports and Outings

1:00 p. m.—Seventeen-mile Drive and Marine Outing.

6:30 p. m.—Abalone Dinner at the Highlands.



Another Benjamin Achievement



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660 Watts 250 Volts

At Last—The Weatherproof Pull Chain Socket

Here's a real achievement—a forward step that marks an epoch in the electrical industry—an *approved* weatherproof pull chain socket—the only one in existence.

The Benco Pull Chain Socket has been approved for use in damp places on account of the high insulation and perfect protection from moisture. The

"Benco" Pull Chain Weatherproof Socket

is different from all other pull chain sockets—and it is better. The pull chain is *directly* downward, therefore positive and simple in its action.

Highly insulated operating mechanism of quick

make and break type. The Benco is part of Benjamin Type "S" interchangeable screw threaded line. When used with holders and reflectors the chain hangs straight down inside the reflector or glassware. Let us send you further facts.

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AN INSTITUTION BUILT ON IDEAS

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, MARCH 1, 1918

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How the Upbuilding of the West is Helping to Win the War—VIII

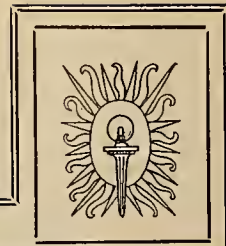
THIS huge, expressive sentinel—the Campanile on the campus of the University of California, hovering over massive academic structures, enshrouded in the eucalyptus and palm growth below—is symbolic of that splendid spirit of the West that is today going forth from academic halls throughout the commonwealths of the West to fight for the cause of democracy. Sixteen hundred undergraduates now enrolled in active service in the army and navy from a single university of the West!

"So you'll live, you'll live, young fellow, my lad,
In the gleam of the evening star,
In the wood-note wild and the laugh of the child,
In all sweet things that are.
And you'll never die, my wonderful boy,
While life is noble and true;
For all our beauty and hope and joy
We will owe to our lads like you."

— Robert Service



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, MARCH 1, 1918

Number 5

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WHAT IS NEEDED IN THE POWER SITUATION—

Thoughtful men who attempt to pierce the uncertain years ahead have much upon which to ponder, for in the solution of the grave problems that present themselves rests much for the future welfare and happiness of the human race.

So interwoven has become the method electrical with practically every phase of human existence that any solution of the more general problem must perforce affect the electrical industry and its future welfare.

While it is difficult to foretell to a full degree just what the outcome of utility life may be in the fuller development of the coming months, there are a few of the issues that can be foretold beyond the question of a doubt.

The first and foremost is that as long as human life prevails the uses of electrical energy will expand and enlarge, and more and more will the affairs of human endeavor be concerned with the efficient development of this type of energy in all its various applications. In view of this fact, then, that central station man or power plant manager who in these strenuous times retrenches in utility expenditure to the point where efficiency is impaired or permanency of service endangered, is not worthy of the high trust reposed in his hands.

The one great thing that is needed in this hour of emergency is the continued efficient development of the hydro-electric resources of the nation. This is not a day of retrenchment. The basis upon which hydro-electric investments have been made is sound and secure. The task ahead is one of education and development.

Let those who have put their years of effort in the development of the hydro-electric resources of the West take heart, for, where the fundamental law is sound and secure, the superstructure of doubt and fear falls powerless before effective education.

Concerted effort should be taken with a broader objective by all interested in the best interests of the electrical industry, to show to the public at large the secure basis upon which such development rests. And in this educational effort no political intrigue is to be tolerated to bring about the desired results necessary for Congress to open up reservoir and power sites upon the national domain. The campaign should be waged agreeable to clause one of President Wilson's fourteen points necessary to establish international peace—namely, that all negotiations be made in the open.

Broaden out the scope of activity that has been taken in such effort as that now under way in California. Make the problem not one of co-operative merchandising alone. If necessary employ the biggest man that money can buy to effectively aid in this inter-co-operative movement among all branches of the industry and—then—go a step further. Collect such effective data that Congress and the public at large must be convinced of the necessity of further developing water power in the West, in order to properly handle

the situation in the East that is absorbing the life blood of the nation.

By the efficient and timely development of the hydro-electric resources of the nation, and the consequent establishing of much needed industrial activities near the scenes of this possible power, can the impending shortage and ultimate exhaustion of coal and crude petroleum be averted.

Let the men of the electrical industry in the West pay heed to this crying need of the hour—full and above-board education—and not only will retrenchment not be found necessary, but an enlightened public sentiment, fully appreciative of the continued sincere and efficient effort of an industry now without a peer in the industrial traditions of the nation, will itself demand that Congress grant all reasonable permits for extending hydro-electric development, and there will result an abundance of private capital willing to further invest in securities of this nature.

Labor is after all the greatest need of the moment. Not only must workmen be found to meet emergencies and shifted from non-essential

**Your
Bottom Drawer**

to essential fields, but we must get more concentrated service from the workmen which we have. This applies not alone to the man who is working for wages, but also to the man at the head, even to the owner.

A modern efficiency engineer accused the man of big business, not long ago, of wanting his employees to be efficient in order that he might play golf. There is something in the accusation that the greatest loss to a concern is in the wasted time which its workers spend in thoughts devoted to other interests. "Look and see what they keep in the bottom drawer," advises one educational director. This is a time when the nation must do double and triple service with the same force of workers.

Industry cannot afford to grant the laboring man too short hours, the head of the concern cannot be allowed to retire before his time. Greater efficiency is needed in every walk of life. What do you keep in your bottom drawer?

With the advances in the theory of lighting of the last few years, we are really entering today for the first time upon the full advantages in illumination of our electrical age. In hardly another field have changes been more radical or have they affected more the life of the individual than in the field of lighting. The advent of each new illuminating medium has widened immeasurably the sphere of application and has revolutionized the theories of the art. Electricity in particular has completely changed the aspect of almost every phase of life. The feature articles of this issue, which cover the fields of theater, store, museum and home lighting, give some conception of the innovations electricity is making possible.

It is interesting to note that the role of indirect lighting is prominent in each case. This is distinctly an electrical development, in a way an outgrowth of the necessity for shading the electric lamp completely from the eye. The eyestrain records kept by a large Western concern indicate that even semi-indirect lighting is hard upon the eyes when used for extended periods, a trouble which has been done away with in the adoption of an indirect fixture.

Perhaps the two most outstanding features of the electric lamp in illuminating practice are that, in the first place, it cannot be looked upon with comfort, and in the second, its light is non-inflammable, and therefore may be placed in any position, at an angle, or even inverted.

This gives a possibility of great freedom in the design of fixtures for all purposes, a freedom which up to recently has been but little appreciated. The early electric fixtures were mere adaptations of the gas jets and chandeliers which went before them, as these in turn had imitated the candle and the torch. The new fixtures and the new theories of lighting mark the full acceptance of the electrical idea. This is a new medium of light with which to work—and in the recent installations expressing conceptions of architects and electrical men, is a dawning realization of the possibilities in the use of electricity. Unquestionably the perfect fixture has not yet been achieved. The field is one as yet unexplored to its depths—and offers much of interest to the illuminating engineer of the future.

Nevertheless, the beautiful and effective recent in-

stallations in interior lighting described on other pages of this issue show the splendid progress that is being made in the West looking toward adapting the method electrical to every branch of service in the modern building interior.

The situation which has been confronting the hydro-electric power plants in those regions of the West affected by this winter's dry spell has been greatly improved by the recent rains. The weather of this winter seems to have provided something "the most unusual" for every part of the country—and in the central and southern Pacific Coast region it was, up to February, absolutely the driest season on record. Reports from the Northwest and Intermountain districts seem to indicate a normal rainfall—but in the mountain regions of California snow was only two inches deep at a period of the year when it usually averages 90 to 100 inches. During the last two weeks some 60 to 70 inches of snow have fallen, but the precipitation is still far below normal. This late snow never packs well and does not give the full amount of water per foot, nor does it last far into the summer season. For the farmer and the man who is not provided with adequate storage facilities the situation is a very serious one, even with prospects of a very wet spring. For the usual power project of the West, however, with its huge reservoirs which conserve the water, whether its precipitation be concentrated into a few weeks or spread throughout the year, the future looks considerably brighter. Plants which looked forward to shutting down completely during the last of the summer, or running at half capacity, will probably reach almost normal, depending on the wetness of the spring. The threatened failure of the hydro-electric power supply was particularly serious just now, with the already excessive drain on oil, and with Congress considering water power bills and ready to be affected by any untoward report. In the case of the weather, however, the worm always seems to turn—and the round of the year's season usually averages up relatively well. Occasionally there is a rumor of the climate having changed, but like the report of rain failure due to the cutting of the forests, which was generally accepted a decade ago in this same part of the West after eleven excessively dry years, it is usually followed by a flood.

Hydro-electric power development in a sense is dependent upon the weather, but the adequate provision of storage facilities upon which such vast sums of money have already been spent and for which further sums are ready, seems to provide an adequate answer to the situation. Nature may be depended upon to do her share eventually, if not at a given date. Such projects as are already serving the West, and others which may be developed under encouragement, represent pure gain to the nation. Not only do they mean so many million barrels of oil saved outright, but in seasons such as the present the existence of these great reservoirs means salvation for the farmer who uses the same water below and who now can count on a steady supply long after other sources have gone dry.

Electrifying The Electrical Fixture

Hydro-Electric Power and the Weather

While the daily commerce reports indicate an ever-increasing commercial and engineering growth with Pacific neighbors in the Orient, casual observation brings to light the fact that engineers and other men of the electrical industry in the West are more and more viewing with increasing interest a possibility of getting more personally acquainted with these countries by taking vacation outings in transpacific voyages.

The Value of the Letter of Credit

It is well, in view of this fact, that a closer attention be paid to familiarizing oneself with means of conveying upon one's person the proper credentials to convert into cash the funds necessary for expenditures while making such tours.

In visiting any of the Far Eastern countries, the traveler will find that the American gold dollar is revered and respected everywhere. Unless one expects to make an unusually long stay in a particular country, it is best to keep one's money in the American units.

To this end one should by all means travel with little actual coinage about his person or in his possession. All recent travelers report that the American Bankers' Association notes are of inestimable service in that part of the world. These notes are accepted in the heart of Japan by merchant, hotel clerk, or banker with equal alacrity, while in the Philippine Islands or the interior of China the same courtesy is always extended.

In case of theft or loss they will be redeemed by the home banks, and this is no little guarantee in Oriental traveling. An American engineer recently was robbed in Yokohama, and reports with grateful thanks that he had but one yen twenty in his purse — sixty cents. His remaining money was securely represented in A. B. A. bank notes absolutely protected and safe in value to him. For the small price of 50 cents per one hundred dollars, these notes may be secured from any American banker before one's departure abroad. At the time of issuing, the local cashier signs each note to identify the purchaser's signature, which the purchaser writes in the presence of the banker. When the purchaser desires to use these notes in a foreign country, he signs again in a place provided, and the signature makes available at once the face value of the note. Without this signature, however, the note is valueless and the American Bankers' Association protects the purchaser against forgery.

In passing it is interesting to call attention to one small feature of Chinese money which it will be well to remember. For each one dollar that you may desire to get changed into twenty-cent pieces, you are given six coins of the latter denomination, or one dollar twenty cents. When straying about in a Chinese port, it is well to remember this fact and fill your pockets

with these smaller coins before starting to pay rickshaw men, Sedan chairmen, or to make small purchases. You will find, however, that the merchant protects himself from too freely accepting the smaller denominations by accepting them for purchases of less than two dollars in value, above which figure the larger denominations must be used.

It has already been mentioned that the A. B. A. checks are readily accepted on all sides for their equivalent in Oriental values. One must, however, at all times have sufficient in small amounts to meet little expenses of daily occurrence. These local moneys may be purchased at regular exchange banks for a moderate cost. Beware of many of the street money changers unless you are posted on the rates of exchange. Usually the purser on the ship upon which you are traveling will give you ample money in exchange for your American gold without charging you a cent. This is done as a matter of courtesy and accommodation to the ship's passengers.

The highest salesmanship consists in making a buyer understand the true merits of the article you are seeking to sell. No less an authority than Charles M. Schwab, chairman of the Board of the Bethlehem Steel Corporation, has stated that the supersalesman is one true to the interests of the customer, and whose supreme purpose is to quicken the imagination of the customer and thus make the customer see the true virtues of the goods the salesman is selling.

The great diversity of new electric appliances for the home that is noted on all sides calls each day for a higher class of salesmanship. One of the greatest elements of skill in a salesman is to create in the mind of the customer the thought that the salesman will in fact be able to produce the goods which he is trying to sell. The samples may be fine, but the customer must know that the man in the factory behind the samples will also do his part to the uttermost.

It is important that the central station merchandising department as well as the contractor-dealer realize to the fullest extent these forceful and necessary ideals in salesmanship. To attain these ideals requires constant thought and study. The beginning of a series of articles found on another page of this issue, under the authorship of Miss Elma Steinmann, is a helpful advent in the West looking toward better and more effective salesmanship. Miss Steinmann, as the head of the educational department of a sales organization in one of the great department stores of the West, sets forth a convincing and forceful treatment of proper methods of approach, store window decoration, advertising and other essentials of producing effective results in the merchandising of electrical ware.

NEW JOURNAL SERVICE: The new problems that have arisen due to the interconnection of transmission lines of the West make a review of the present status of high tension transmission service in the West of great timely interest. The feature of the issue of the Journal of Electricity for March 15, 1918, will be a discussion of some of these problems. The hydraulic units for the giant Big Creek plant of the Southern California Edison Company, which have set a new world's record for this character of service, will be described in detail. In this same issue will also be described the remarkable new line that is being built by this company to connect with the San Diego Consolidated Gas & Electric Company, which involves converting the alternating current from 50 cycle to 60 cycle energy, in addition to many interesting new features of construction work. Phases of interconnection experienced in other territories will also be treated in a manner that will prove interesting and helpful.

INNOVATIONS IN THEATRE ILLUMINATING

(It is interesting to note in how many phases of a motion picture theater's business electricity plays a part. From the flood lighted exterior to the electrically heated organ chambers, to the special electrical equipment of the operating room, this theater has made use of the latest devices in every branch of electricity. Added to this the unusual beauty of fixtures and stage effects makes this theater one worthy of detailed study from the electrical standpoint.—The Editor.)



THE LOBBY

There is great variety shown in the electrical fixtures — but all are attractive.

the theater is flood lighted), its main feature of attractiveness lies in the artistic lighting scheme.

The stage is framed in a fan-like sounding board of metallic finished filigree work which provides space for the organ pipes, as well as offers an effective reflecting surface for the stage illumination. The color effects are particularly good and the changes of light with the gradual brightening of the blue back-curtain in peacock design, in contrast to the side hangings of old gold, provides a picture of rare beauty.

The auditorium lighting is semi-indirect and is arranged so that a dim light is provided even during the exhibition of pictures, and then brightened during organ solos and intermissions. Aisle lights alongside each row, and exit lights provide effective illumination underfoot and for emergencies.

The organ itself is electrically driven with an ingenious arrangement by which it sinks down out of sight while the film is running and then rises to within view of the balcony as it is being played.

A lounge room of considerable size is provided for the convenience of patrons, which is effectively illuminated by central fixtures, side brackets and portables. An illuminated fountain forms an interesting feature here.

Telephones are provided on this floor for the free use of the public, and a house system connects offices, ticket booths, stage and organ rooms.

FROM the motion picture equipment itself to the aisle lights and the telephone systems, the latest in electrical devices has been sought out to make the California Theater of San Francisco a thing of beauty and of comfort for its patrons.

The building itself is of reinforced concrete in the gothic style with main auditorium, vestibules, lounge room, rest rooms, try-out rooms, offices and store rooms. Both within and without (for

The details of electrical equipment are most complete. Beginning at the service switchboard, we find a duplicate set of services both for A. C. and D. C., with necessary single throw switches on each current for the general lighting and power, and an automatic throw over switch on the exit and emergency feeds.

From this point connection is made to sub-distributing panels in the basement directly below the stage switchboard, to the stage board and panels in the lobby controlling the exit and emergency lighting, general lighting throughout the lounging room, exterior lighting and motors on roof, to panels in the operating room, to the try-out room, to each motor in basement, stage and attic, and to each heating unit in each of the organ chambers.

The panels in the operating room are fed from each A. C. and D. C. service and double throw switches provided for each machine, dissolvers, spot-light and motors. Weston ammeter and volt meters for arc and primary voltages are provided on the panels with necessary switches for taking the reading on any machine off either service. Rheostats are placed in a special chamber under the room, this chamber as well as the operating room being ventilated by forced draft created by fans placed on roof. Equipment is complete with the Motiograph projecting machine, spot-

light, dissolvers and winding and rewinding apparatus. All panels are provided with sliding doors.

The try-out room is located in basement, fully equipped with projecting machines and all necessary apparatus.

The stage equipment is complete with three sets of borders, side and foot lights, each containing lamps of four colors, viz: white, red, blue and amber, seven three-gang incandescent pockets, seven D. C. arc pockets in the stage floor, four D. C. arc pockets in spot and fly

galleries, and two flood lights on the balcony front. General Electric Company dimmers are provided for each color in each border, side and foot light, and two of the three-gang incandescent pockets. These dimmers are provided with individual and master levers. All circuits are controlled by knife switches on the stage board, master control by push-button switches here operating contactors on the board in the basement.

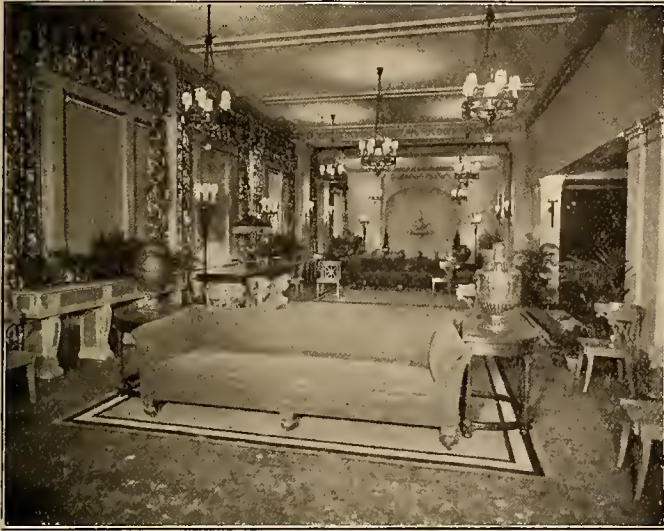
The auditorium lighting is semi-indirect and is also wired in four sections to each outlet for as many



THE THEATER IS FLOOD LIGHTED AT NIGHT

A night scene would appear not so different from the one shown here except that the theater announcements and the electric sign on the roof would stand out. Projectors are located on the roof of the marquee.

colors, viz: white, red, blue and amber. These lamps are fed through four sets of motor-driven dimmers, including a duplicate set of dimmers for footlights. These footlight circuits are provided with double throw switches on the stage board so that they may be fed through the auditorium or stage set of dimmers as

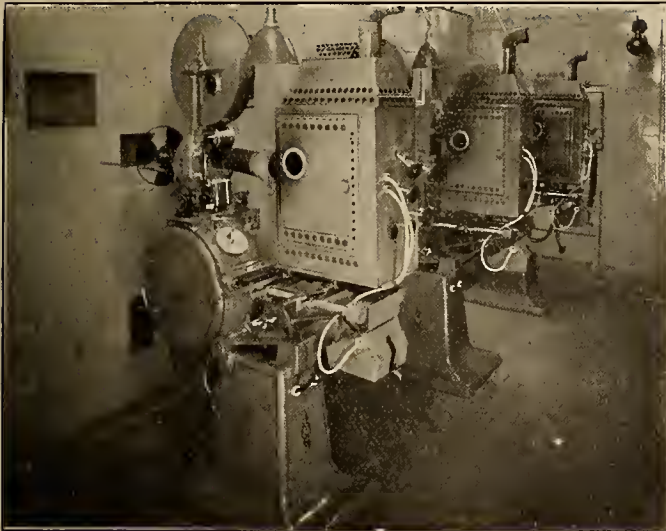


THE LOUNGING ROOM

A system of direct and semi-indirect lighting gives a pleasant and restful effect.

desired. All of this lighting and the motors are controlled by three sets of push buttons in the operating room and on the stage board, operating contactors placed on the board in basement.

Exit and emergency lighting consists of aisle lights placed in the floor of the auditorium and attached to the rails or set in the walls of balcony aisles,



OPERATING ROOM

The latest electrical equipment is used throughout

in addition to the regulation lighting required under the ordinance in corridors, lavatories and exits. The lighting of the main vestibule is a combination of semi-indirect and indirect lighting, as is also that of the lobby and lounging room.

The exterior lighting of the theater consists of three projectors on the marquee on Fourth street and five on the marquee on Market street, of 1000 watts each, which are placed so as effectively to bring out

the face of the building. In addition to this, there are 1000 lamps in the two marquee and 700 lamps in the sign, which is placed on the roof, displaying seven different designs.

The organ chambers are electrically heated, each heater being automatically controlled by thermostats set to keep a uniform temperature both day and night.

The power service consists of motor-driven apparatus for the ventilating system, organs, ejector, vacuum, sprinkler, water supply, lift for the console and curtain. All motors are provided with "Safety First" equipment. The lift for the console is operated by a push button on the console and is equipped with limit switches and an electric brake on the motor. The



THE AUDITORIUM LIGHTING

Note the aisle lights as well as the beauty of the semi-indirect fixtures. The use of color in both stage and general lighting is extremely effective.

curtain is operated by eight push buttons (five on the stage and three in operating room) which permit of its being raised, lowered and stopped at any point.

A call and signal system is provided which consists of signal lamps placed at points throughout the auditorium and lobby, which may be operated from a switch in ticket booth. A full automatic non-interfering Decker intercommunicating telephone system of eighteen stations connects all executive offices, ticket booth, operator's room, stage, etc. Five of these stations are equipped with the Decker loud-speaking receivers, which permit the party called to carry on a conversation without the necessity of having to remove the receiver from the phone. A Couch system of phones between the six organ chambers and the console permits of conversation between any chamber and the console.

GROUND CONNECTIONS FOR DISTRIBUTION SYSTEMS

BY W. C. HESTON

(The great cost of the prescribed ground for overhead distributing systems, led a Portland company to experiment with various types of ground to see whether a more inexpensive method might not be found which would meet requirements. The results of these comprehensive tests and the conclusions drawn from them are here presented by the assistant superintendent of the department of wires and conduits of the Portland Railway, Light & Power Company.—The Editor.)

Following the publishing and placing into effect of the Public Service Commission's regulations governing overhead line construction, which provided that the neutral point or wire of all transformer secondaries strung or erected for use in low potential distributing systems, where the normal maximum difference of potential between the ground and any point in the secondary circuit, when grounded, would not exceed 150 volts, the Portland Railway, Light and Power Company, due to the high cost of complying with the specifications calling for the installation of a 1/16 inch copper plate, having an area of not less than 3 feet by 6 feet buried in coke below the permanent moisture level, and a desire to investigate the relative merits of such a plate ground, and galvanized iron pipes driven to various depths, conducted a series of tests on the relative effectiveness of these different types of grounds, as outlined and described herein.

Tests were first conducted on a 3/4-inch galvanized iron pipe driven into the ground to a depth of 6 feet.

In order to carry out this test a tap was made to a 600 volt railway feeder and connected to the ground pipe with an ammeter in circuit and a voltmeter across the line.

Simultaneous readings of the instruments were taken at intervals of one minute. These readings with the corresponding resistances are as follows:

Time—	Current	Voltage	Resistance
Start	7 amperes	600 volts	85.7 ohms
1 minute	5 "	600 "	120 "
2 minutes	4 "	600 "	150 "
3 minutes	3.75 "	600 "	160 "
4 minutes	3 "	600 "	200 "
5 minutes	2.9 "	600 "	206.3 "
6 minutes	2.8 "	600 "	214.7 "
8 minutes	2.5 "	600 "	240 "

It will be seen from these tests that the initial resistance of the ground element was quite high and that it increased very rapidly after the first application of current due to the drying out of the earth around the pipe.

The soil in the district where this pipe was driven is comparatively free from gravel and rocks, and as the weather had been rainy for a week prior to this test, this type of ground was tested under favorable conditions.

However, attention is called to the fact that, due to the method of making this test, the resistance of the ground pipe alone was not obtained; the resistance given above being that of the ground pipe and the street car rails in series. It is impossible under the circumstances to say what the resistance from the rails to the earth is, and for this reason it is also impossible to say what the resistance from the pipe to the earth is. It is probably safe to assume that the resistance of the pipe is more than half of the resistance of the two in series.

Another test to determine the resistance of this same type of ground was made by a method to be mentioned later, which gave the resistance of the pipe alone. The results of this test indicated a resistance of 30.4 ohms, which is probably about the resistance this type of ground would be found to have in most all parts of the city. The soil in this case was similar in all appearances to that of first test. The worst feature of this type of ground is the rapid drying out of the earth around the pipe when a current is flowing.

In order to determine the effectiveness of a ground connection made in accordance with the Commission's specifications, a tinned copper plate 3 feet by 6 feet, having a total area of 36 square feet, was placed in the ground in a horizontal plane at a depth of 6 feet, and a layer of coke 3 inches in thickness placed on each side of it.

A test was then made by making a tap to a 600 volt railway feeder and connecting to the plate with an ammeter in the circuit and a voltmeter across the line.

Following are the simultaneous readings taken on the instruments and the resistance corresponding to these readings:

Time—	Current	Voltage	Resistance
Start	41 amperes	600 volts	14.65 ohms
1 minute	39.5 "	595 "	15.1 "
2 minutes ...	38.5 "	575 "	14.95 "
3 minutes ...	39.5 "	595 "	15.1 "
4 minutes ...	38.25 "	545 "	14.25 "
5 minutes ...	38 "	548 "	14.35 "
10 minutes ...	37.5 "	570 "	15.2 "
15 minutes ...	38 "	575 "	15.15 "
20 minutes ...	37.5 "	525 "	14 "
25 minutes ...	38 "	575 "	15.15 "
30 minutes ...	38 "	565 "	14.9 "

The fluctuations in resistance are largely due to the impossibility of reading the instruments simultaneously. The resistance apparently dropped from 15.1 ohms at the start to 14.9 ohms at the finish, maintaining almost a constant resistance throughout the time the current was applied.

This test was made the day after the plate was installed. At the time it was installed a quantity of 30 gallons of water was poured into the hole so that this test was made under favorable conditions. In this case, as in the case of the first pipe mentioned, the resistance of the ground plate and the street car rails in series was obtained rather than the resistance of the ground plate alone.

This plate was installed in the spring of 1915, and on August 31, 1915, tests were made to determine if there was any appreciable increase in resistance due to the ground drying out during the summer season, and also to see if the ground around the plate would dry out due to the flow of a current from the plate into the earth for a short period of time.

The resistance decreased about 2 ohms between the time the plate was installed and the time this test was made, notwithstanding the fact that the weather was dry the greater part of this period.

On October 3, 1916, a little over a year later, current was again applied to this plate and a current of 65 amperes at 592 volts was found to flow. The resistance corresponding to this current and voltage is 9.1 ohms which is about 6 ohms less than when first tested, and about 4 ohms less than when tested the second time.

There is little doubt as to the permanence and effectiveness of this type of ground connection, or of its being able to meet all requirements. The high cost of installing a ground of this type, however, makes its use prohibitive except in special cases. The cost of installation was \$41.00, and with the present prices of copper it would cost considerably more.

As the two types of grounds above mentioned seemed impractical, it was decided to experiment with the so-called "treated" ground, and with pipes driven to a considerable depth. Accordingly, a 3/4-inch galvanized iron pipe was driven to a depth of 18 feet in a district where the soil is very gravelly.

At a depth of 9 feet current was applied to the pipe and a current of 3 amperes at 575 volts was found to flow. Current was applied at various depths, but did not increase above 3 amperes during the driving process. About 3 1/2 pounds of rock salt was then placed around the pipe and thoroughly soaked into the ground with water. The addition of the salt and water brought the current up to 10 amperes, which seemed to be about the maximum which could be obtained.

The resistance of the ground element was 192 ohms before the salt and water were added, and 57.5 ohms afterwards. It is quite evident that permanent moisture was not reached at a depth of 18 feet and it is hard to say at what depth it would have been reached.

The soil at this point was evidently exceptionally gravelly and in order to confirm this belief and also to see if a satisfactory ground in this district could not be obtained without resorting to treating, another test was made about a thousand feet from the point where the first test was made.

The following tabulation shows the readings taken and the corresponding resistances at the various depths:

Depth of Pipe	Current	Voltage	Resistance
9 feet	2 amperes	238 volts	119 ohms
10 feet	2.05 "	234 "	114 "
11 feet	2 "	233 "	116.5 "
12 feet	2.1 "	234 "	111.5 "
13 feet	2.2 "	235 "	106.7 "
14 feet	2.3 "	236 "	103.5 "
15 feet	2.4 "	236 "	98.3 "
16 feet	2.2 "	236 "	106.8 "
17 feet	2.5 "	236 "	94.4 "
18 feet	2.5 "	236 "	94.4 "

No attempt was made to treat this ground. It will be seen that the resistance was only about half that of the first ground before it was treated, indicating that soil conditions in the first case were a little unusual.

A test was then made on a one inch galvanized iron pipe driven to a depth of 12 feet into the ground, in the Irvington district where a clay soil, free from rocks and gravel, is found.

This pipe had about 300 quarter inch holes drilled into it between points 3 feet from either end, making a sort of sieve; the theory being that if this pipe were to be filled with salt after it had been driven into the

ground, and water poured into it to dissolve the salt, a salty solution would be carried out through the holes and saturate the surrounding earth, and after this had been done a few times, if the pipe were again filled with salt without the addition of water, the salt would very gradually dissolve and pass out through the holes and thus maintain a salty condition of the soil around the pipe for a considerable length of time.

It was found, however, that the salt dissolved very rapidly and apparently would remain in the pipe for such a short length of time after its installation that it was not worth the time and expense to drill the holes.

After the pipe had been driven to its full depth of 12 feet, current and voltage readings were taken in the manner described in the last test mentioned. A current of 7.5 amperes at 240 volts was found to flow, which gives a resistance of 32 ohms. About 5 pounds of salt was then placed in and around the pipe and a quantity of water added by means of a hose. The current was again tested and found to be 17.5 amperes at 240 volts, giving a resistance of 13.75 ohms.

It was believed that if a pipe was driven to a depth of 15 or 18 feet in this same vicinity, equally as low resistance could be obtained. Accordingly, a one inch pipe was driven to a depth of 18 1/2 feet, at a point about 240 feet distant from the other pipe.

Current and voltage readings were taken at various depths; these readings and the corresponding resistances are as follows:

Depth	Current	Voltage	Resistance
9 feet	7.4 amperes	236 volts	31.9 ohms
10 feet	7.7 "	236 "	30.65 "
11 feet	8.6 "	236 "	27.45 "
12 feet	8.9 "	235 "	26.4 "
13 feet	9.25 "	234 "	25.3 "
14 feet	9.6 "	237 "	24.7 "
15 feet	10.4 "	236 "	22.7 "
16 feet	10.6 "	238 "	22.27 "
17 feet	10.8 "	238 "	22.05 "
18 feet	11.2 "	238 "	21.25 "
18.5 feet	11.4 "	239 "	20.95 "

Expectations were not quite fulfilled but the results of this test show that quite a satisfactory ground in soil of the nature encountered here can be obtained by driving a pipe to a depth of 18 feet.

At the time this test was made the resistance of the other ground was measured and found to be 12.2 ohms, showing a decrease of 1.55 ohms in a period of 8 days.

Inasmuch as the method of measuring the resistance of the pipes in these cases did not give the true resistance of the pipe alone, but instead the ground pipe and the water system in series, it was decided to employ a means of testing which would eliminate this error. This was done as follows: The ground connection from the water faucet was removed and one side of the 240 volt (ungrounded) secondary was connected to one pipe and the other side to the other pipe with an ammeter and voltmeter in the circuit. The resistance of the two pipes in series was found to be 32.4 ohms. As stated above, the resistance of the first pipe was 12.2 ohms, and the last one, 20.95 ohms.

Designating the first pipe as X, the second as Y, and the water pipe as Z, we have:

$$Y + X = 32.4$$
$$Z + X = 12.2$$

$$Y - Z = 20.2$$

Subtracting

Then—
 $Y - Z = 20.2$
 $Y + Z = 20.95$ Adding
 $2Y = 41.15$
Or—
 $Y = 20.575$ ohms
Similarly
 $X = 11.825$ ohms and
 $Z = .375$ ohms

This method, in addition to determining the resistance of either pipe alone, brings out an interesting feature: that is, the resistance of the water system to ground, which, as shown above, is .375 ohms.

Another of the "sieve type" ground pipes was installed on the west side of the river. This pipe was driven to a depth of 12 feet and tested in the manner just described. The resistance before the salt and water were added was 26.8 ohms.

This resistance was obtained as follows: A ½-inch temporary pipe was driven about 3 feet into the ground and 240 volts impressed across this and the ground pipe with an ammeter in circuit. The current which flowed at this voltage was 3.5 amperes, giving a resistance of 76 ohms. This test was repeated, using the temporary pipe and one of the 6-foot pipe ground connections which happened to be installed at the base of the pole. At a pressure of 239 volts, a current of 3 amperes flowed, giving a resistance of 79.6 ohms. In like manner with 240 volts across the main ground and the old ground, a current of 4.2 amperes flowed, giving a resistance of 57.2 ohms.

Designating the resistance of the main ground, the old ground and the temporary ground by A, B and C, respectively, we have:

$A + C = 76$
 $B + C = 79.6$ Subtracting
 $A - B = 3.6$
Then—
 $A - B = 3.6$
 $A + B = 57.2$ Adding
 $2A = 53.6$
 $A = 26.8$ ohms

Similarly, the resistance of B was found to be 30.4 ohms, and C, 49.2 ohms.

About 5 pounds of salt was then placed in and around the pipe and a quantity of water added.

The above tests were repeated with the following results:

$A + C = 52.7$
 $B + C = 68$ Subtracting
 $A - B = 15.3$
Then—
 $A - B = 15.3$
 $A + B = 22.7$ Adding
 $2A = 7.4$
 $A = 3.7$ ohms

Similarly, $B = 19$ ohms and $C = 49$ ohms

In order to check the resistance of the main ground determined in this way, one side of the 240 volt secondary was grounded to a water hydrant about 300 feet away and the other side was connected to the ground pipe with a voltmeter and ammeter in circuit. Nineteen amperes flowed at a pressure of 240 volts, indicating a resistance of 12.63 ohms.

The wide discrepancy between this resistance and the resistance of 3.7 ohms as obtained by the other method is undoubtedly due to the earth around the old ground becoming pretty well saturated with the salty solution due to the fact that it was only 18 inches distant from the main ground. If this were true,

there should be quite a reduction in the resistance of the old ground, which it will be seen from the above is exactly the case, the resistance having decreased from 30.4 ohms to 19 ohms. It will be noted that the resistance of the temporary ground decreased only .2 of an ohm.

It will also be noted that the resistance of 26.8 ohms before the salt was added and 12.63 afterwards, check very closely with resistance of 32.4 ohms before and 12.2 ohms after the salt was added to the other sieve type ground.

In order to have more complete data on the effectiveness of pipes driven to a depth of about 18 feet, a test was made on a ¾-inch galvanized iron pipe driven to a depth of 19 feet, in the Sunnyside district, where the soil is similar to that found on the west side and in the Irvington district.

Beginning at a depth of 11 feet, current and voltage readings were taken at various depths by means of grounding one side of the 240 volt secondary to a nearby water faucet and connecting the other side of the line through the ammeter to the ground pipe, with the voltmeter across the line.

Depth of pipe, current and voltage readings, and the corresponding resistances are given below:

Depth of Pipe	Current	Voltage	Resistance
11 feet	14.6 amperes	236 volts	16.15 ohms
12 ft. 4 in.	15.7 "	235 "	15 "
13 feet	17 "	235 "	13.8 "
14 feet	17.8 "	234 "	13.15 "
15 feet	19 "	235 "	12.38 "
16 feet	19.8 "	234 "	11.8 "
17 feet	19.4 "	234 "	12 "
18 feet	19 "	234 "	12.3 "
18 ft. 6 in.	19.8 "	234 "	11.8 "
19 feet	20.5 "	234 "	11.40 "

At 19 feet the current was left on a little longer than at the other depths, and it was noticed that it began to gradually increase, and after a period of about 10 minutes it reached a value of 23 amperes. The current was left on for about 5 minutes after this and it fluctuated gradually between 21 and 23 amperes, averaging about 22.5 amperes. No explanation is offered for this phenomenon.

It is planned to test these various ground connections from time to time to determine what changes time and varying weather conditions will bring about.

However, due to the urgency of adopting a more effective type of ground than the one in use, it was felt that sufficient data had been gathered to justify the following conclusions:

Where soil conditions are in general the same as those prevailing where most of the above tests were made, that is, a clay soil free from rocks and gravel, a 1-inch galvanized iron pipe driven to a depth of 18 feet will prove to have a resistance low enough so that the ground connection will fulfill all requirements.

Where the soil is gravelly and rocky, the only means of obtaining a satisfactory ground is to install a plate laid in coke similar to the one already mentioned.

In order to make it economically possible to use the plate type of ground connection, it would have to serve as a ground for several transformers connected to a common ground bus.

DEPARTMENT STORE LIGHTING

(That the ideal fixture for department store illumination had not yet been produced was the final judgment of the management of this department store—and they therefore had one specially designed. The store is the largest of its kind west of the Rockies and the designer of the new fixtures is the well-known architect of the "Court of Abundance," Louis Mullgardt, who here tells of his work.—The Editor.)



The fixtures were done in rough plaster by the manufacturer, then dried and painted in the store itself

THE main idea in a department store is to see the goods, and any illumination which draws the eye away from them is a drawback rather than an asset. For this reason the usual type of opalescent fixture which is designed by attractive lines to lead the eye to the main feature of the lighting, the shining globe, has certain incurable disadvantages. In the first place, the source of light itself is not a

thing of beauty—in fact, it is painful to the eye to look upon it—it is rather the pattern and texture of the surface illuminated which provides the pleasurable effect. In the second place, the lighting should not attract attention at all—it should attractively connect itself with the architecture of the ceiling and, together with the beauty of show cases or floor coverings, provide merely an unanalyzed background for the goods displayed.

These factors have been carefully considered in the fixtures recently installed in the main floor of the Emporium department store in San Francisco. The great height of the ceiling (21 ft. 3 in.) called for special intensity of illumination, but the glare of semi-indirect fixtures was felt to be offensive as well as markedly to increase the eyestrain of the store employees. Experiments were carried on at some length, attempts being made to light from the columns and with various types of bowls, but the expense of rewiring or of the metal and ornamental glass needed for effective fixtures was so great as to make the cost prohibitive.

The present fixture obvi-

ates these difficulties. The wiring remains unchanged, the fixtures hanging in the center of the 24 by 16 foot bays, usually over the center of the aisle. Eight 75 watt type C Mazda lamps are used in each, providing 600 watt illumination in contrast to the 400-500 watt used in the old type of fixture. The light is found entirely adequate even in the men's clothing and jewelry sections, where extra illumination has always been provided hitherto. Of course special showcase illumination for the showing up of precious stones or cut glass is further provided.

The fixture provides for entirely indirect lighting, being indeed made of plaster cement which is wholly opaque. This feature of the bowl is quite unique, but has worked out very satisfactorily. The great factor to its advantage, of course, is that it is extremely inexpensive. The ingenious method of perforating the bowl so that light filtering through the interstices makes the whole appear translucent, gives the material an effect of lightness and purity of texture which is very attractive.

The bowl is 30 inches across, and is hung so that the lower edge is 29 inches from the ceiling. With the idea of connecting the fixture more definitely with the ceiling architecture, the stem was at first made considerably shorter, but experimentation showed this to be the most effective height. The fixture is quite heavy, and in order to insure safety in the installation all outlets were tested by suspending a weight of 200 pounds from them before attaching the permanent globe.

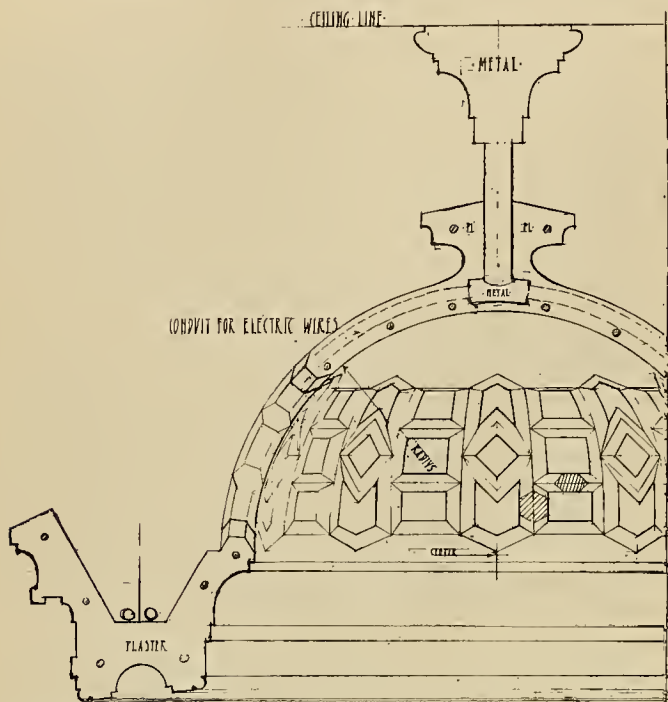
The problem of cleaning is the greatest in connection with their maintenance. In order to keep the illumination up to standard, not only the globes but the fixture itself must be cleaned regularly, as any dust on either diminishes the light reflected to a very appreciable degree. At first it was planned to dust everything carefully once a month, and a long ladder and an ordinary duster were used in the process. This resulted in too great a record of broken filaments and now a bellows is used to better effect. It is hoped

THE EMPORIUM ILLUMINATION

BY LOUIS CHRISTIAN MULLGARDT

The fundamental requisites of a department store count successful artificial lighting for proper display of goods on sale as a vital necessity. Department stores are invariably of such magnitude, and the obstruction caused by cases, shelving, counters, and goods on display, is so great as to make it physically impossible to satisfactorily illuminate the interior by any structural process of daylight illumination, as to make it necessary to rely upon artificial lighting, both day and night. The fundamental object in this instance was to design a fixture which would be simple and reasonably attractive and adaptable to the outlets which had been previously established and used in conjunction with the usual type of fixture, with an opal bowl, metal rim, suspended on chains, the lamps being arranged within the bowl and the light filtering through as well as being reflected against the ceiling. The ceiling resembled a succession of illuminated discs, with shadow lines cast by the conduit rod and suspension chains. The fixture here illustrated provides an absolutely indirect system of lighting, whereby the entire volume of light is reflected against the ceiling and thence refracted to illuminate the sales department. The visible illuminated surface on the ceiling shades off, from highest degree of intensity, immediately above the fixture, to an undeterminable distance in all directions without creating a disc or shadows within the area. The dome of the fixture is filigreed to admit the light within, giving the fixture a transparent appearance of lightness. The illumination created thereby falls equally from all sides to the sales space below and casts no shadows on a horizontal surface. The fixtures are made of plaster of paris, with the conduits concealed within the structure. The exposed surfaces are of a light ivory color, to match the ceilings and to make them as inconspicuous as possible. They may be made any color, or liberally decorated if desired, without altering the fundamental principles of indirect illumination.

eventually to have a blow pipe attachment and a convenient ladder arrangement which may be easily controlled from above, and yet not too bulky to permit of storage on the main floor. The lamps are cleaned once every four weeks, and the fixtures painted fresh every three months.



The wires are led down the stem to the junction box, thence through conduits along the ribs of the fixture to the trough, where they terminate in a socket

This system of lighting is carried throughout the main floor, where there are 176 fixtures in all, and is to extend to the second floor as well. Elsewhere in the store semi-indirect lighting is used except in the basement, where the records of eye trouble kept by



There are no shadows cast by these lamps either on the ceiling nor on a horizontal surface below. The Emporium is known as the "Dome" store, which makes this fixture particularly appropriate

the medical department showed the advantages of the indirect system. Although the ceiling here is comparatively low and artificial light must be relied upon altogether, there is now no greater eyestrain reported from this department than elsewhere.

The fixtures were designed by Louis Christian Mullgardt and manufactured by Thomas Day.

GROWING TRADE WITH NEW ZEALAND IN ELECTRICAL GOODS

The improved position that is being attained by the United States in sales of electrical goods to New Zealand during the war is expected to continue after normal conditions have been restored. An increased volume of trade will be produced in part by a more widespread use of electricity in that country, according to a report that has been published by the Bureau of Foreign and Domestic Commerce. A greater demand for the various appliances that add to the comfort of living is predicted.

The standard of living is good in the island, says the report, and there is an absence of a poor class, but there are some modern conveniences of which the people have not generally taken advantage. In the electrical field this is quite noticeable, a fact attributed in part to the rigid requirements of the fire underwriters and in part to the natural conservatism of the people.

Of the total imports of \$2,300,000 worth of electrical goods in 1913, the United States supplied 15 per cent, England 65 per cent, Germany 5 per cent, and Sweden about 5.4 per cent. In 1914, during which the war made itself felt upon shipping, the total imports were valued at \$2,136,000, of which the United States contributed 14.4 per cent, England 66 per cent, Germany 8.6 per cent, and Sweden 4.4 per cent. Imports amounted to \$1,934,000 in 1915, the first complete year under war conditions, the United States supplying 18.8 per cent, England 70 per cent, Germany 0.7 per cent, and Sweden 4.2 per cent. Japan appeared in the field in 1915 with sales amounting to \$12,800.

AMERICAN CHAMBER OF COMMERCE FOR MEXICO

American residents and firms in Mexico are considering the establishment of an American Chamber of Commerce in the capital. A committee appointed last month has submitted a prospectus in which the aims of the proposed organization are set forth. These are stated to be:

To establish a purely commercial and nonpolitical organization which will foster the friendly relations between Mexico and the United States, and which, in co-operation with the representatives of the United States in Mexico, will be able to initiate an active campaign for American trade;

To form a clearing house wherein business offered to firms outside their particular line may be promptly brought to the attention of such firms as are equipped to handle it;

To establish headquarters in Mexico City for local organization and for affiliation with chambers in the United States and with American chambers in the cities of Latin America and Europe;

To offer membership to American firms and American residents in the Republic and in the United States;

To secure correspondents throughout Mexico and especially in localities where no American consular officers are stationed;

To compile the information thus gathered and to distribute or utilize it for the benefit of members and for the promotion of American trade and industry;

To publish a periodical bulletin and market reporter, carrying paid advertisements, and ultimately to establish and let space for exhibits both of American manufactures and of the products of Mexico;

To take up such other activities as the members may determine.

LIGHT AND POWER PROBLEMS IN BRITISH COLUMBIA

(The recommendation of the formation of a Public Utilities Commission, was the conclusion reached by Dr. Adam Short in his recent report as Commissioner for the investigation of the British Columbia Light and Power Company. The survey was made by the Government at the request of the company, as a result of the strike difficulties in Vancouver last June. The situation reported, as it affects light and power service, is here discussed at length.—The Editor.)

Light and power are furnished to the City of Vancouver and the other districts on the mainland by the B. C. Electric Railway Company, through the Vancouver Power Company, one of its subsidiaries. The total capital invested in this plant amounts to \$16,625,510. This is made up as follows:

Hydro-electric, Lake Buntzen-Coquitlam works.....	\$8,343,668
Steam plant, Vancouver.....	1,194,386
Sub-station and transmission lines.....	3,715,774
Light and power distribution.....	3,371,682

The Company also buys power from the Western Canada Power Company under a contract entered into in 1913 and running for twenty years. The gross earnings from the light and power in Vancouver district amounted in 1916 to \$1,475,723, made up from incandescent and street lighting \$1,172,492, and commercial power \$303,230.

In supplying Vancouver and district 79,848,302 k. w. h. were used for all purposes, including street railway. Of these 52,183,284 k. w. h. were employed for light and power, including street lighting.

Judged alike from the point of view of their application to the conditions of Vancouver district and by comparison with rates elsewhere, it must be admitted that the rates charged by the B. C. Electric for the larger quantities of power for commercial and industrial purposes are on the whole fair and reasonable. There is wisdom also in the policy adopted of making special low rates for industries which are able to use electric energy in large quantities, especially during a large proportion of the day, or, best of all, during the night or other off-peak periods. These rates, whether according to regular schedule or on special contract, compare quite favorably with those of Seattle and other favored centers. This is an important fact because it lies at the foundation of the future industrial development not only of Vancouver district, but of the whole Fraser Valley, as well as the Island of Vancouver.

As to street lighting, the rates are certainly exceptionally low, especially in comparison with what may be considered a reasonable rate of lighting for other purposes.

When we come to domestic light and power, however, we find that apart from the special cooking and heating rates the charges are high, especially for a hydro-electric plant. Moreover, it would appear that the higher rates act considerably as a discouragement to the use of light and power where they are taken through the same meter, as must be the case in the great majority of households.

In July, 1916, the number using not more than 12 k. w. h. for the month were 10,773, while in December the numbers were 4,347. On the other hand, the numbers of those who used over 12 k. w. h. were, in July 5679, and in December 13,472. Thus, for the month of July, nearly two-thirds of the accounts of the residential consumers did not meet the expenses of

the company in serving them, and even in December one-quarter of the consumers were in the same position. Two conclusions inevitably result from such a situation: First, that the company should follow the sound practice of the majority of the electric light corporations, municipal as well as private, and make a minimum monthly charge of not less than 50 cents, which would meet approximately 50 per cent of the cost of maintaining the service. On the other hand, by lowering the rates for domestic light and power there would be a very direct incentive to use the current more freely and more regularly. This applies not only to the large number who are unprofitable consumers, but to those who take a larger portion and might easily be encouraged or induced to employ electricity more freely, not perhaps so much in the line of light as in the greater use of the rapidly extending comforts and conveniences which are now placed at the disposal of the community and which furnish a very considerable substitute for the power and heat derived from coal.

No more striking example of what may be accomplished in the way of rapidly extending the use of electrical power, both as to the quantity employed and the range of its uses, is furnished than by the City of Winnipeg. The use of electricity for cooking and heating has particularly expanded in this city, owing to the exceptionally low rate of 1 cent per k. w. h. There are now in use over 35,000 meters.

The net result of the Winnipeg experiment is that through low rates and active canvassing, which chiefly consists in explaining to consumers, whether actual or prospective, the many advantages to be obtained from a more extensive use of electricity, the heavy deficits which were at first faced are now converted in a small but respectable surplus, which bids fair to increase steadily.

In Winnipeg as elsewhere a minimum monthly charge is exacted, the amount being 50 cents for light and \$1.00 for power. The management has also adopted and strongly advocates a system of customers' deposits. The amount is \$3.00, and on this interest at 6 per cent is allowed. Out of the 35,000 meters is use during the past year there were 18,000 removals.

The possibilities for extending the market for electrical power are very much greater than the corresponding possibilities in the case of a street car service. Apart from the original location of one's abode or place of business, only to a very limited extent will a reduction in car fares induce extra travel, because the normal use of cars is incidental only to one's business or other settled requirements. But in the case of electric power every reduction in rates places within the range of the consumers new or enlarged opportunities for acceptable services which once adopted, an extension of use is natural, especially if rates continue to decrease.

THE LIGHTING OF A MUSEUM

BY CLOTILDE GRUNSKY

(It being the object of a museum to show things, it is necessary that the exhibits be adequately illuminated. The difficulties of cross reflections in the glass cases and the special features of lighting animal groups to simulate the wild life in the outdoors offer problems which need ingenuity as well as knowledge of illumination practice for their solution. The effective use of electricity, not only in the main lighting of the building, but also in special spectacular features, is one of the great assets of the Academy of Science Museum in San Francisco.—The Editor.)



Some of the groups are shown always under artificial light—others only when the daylight which filters through the skylight is not adequate

THE two-fold purpose of a museum—to provide material and opportunity for research work and to display certain of its collections for the benefit and entertainment of the public—makes the task of the lighting of such a building one which presents problems of particular interest.

The Academy of Sciences, located near the Music Stand in Golden Gate Park, San Francisco, is the largest museum of the Pacific Coast and perhaps the finest in certain of its exhibits of any in the United States. The major work of the institution, of course, is carried on in its research departments. Extensive collections of reptiles, fossils, insects, botanical specimens and the like, are stored away in drawers or cases for the use of students and scientists doing special work. New investigations, expeditions for the collection of data and the publication of information and discoveries as made form the routine work of the staff of scientists. Further than this, the museum provides weekly lectures of scientific interest open to the public, and maintains a regular exhibit museum.

As can be seen, the lighting of such a building involves features of office building lighting, library prob-

lems, the proper illumination of the lecture hall as well as the peculiar problems involved in the lighting of exhibits. In order to understand the difficulties of this latter problem, it is necessary to have an idea of the plan of the museum.

There are three large exhibit halls, 180 feet in length by about 60 feet in width. Of these one is filled with a very fine loan collection of Indian baskets and ware, the other two are devoted to so-called "Habitat Groups." The birds and mammals of the Pacific Coast are featured in these groups, being presented as they are found in nature. The backgrounds are painted by the finest artists obtainable so as to merge imperceptibly into the foreground where the trees and shrubs and flowers, even the rocks, of the animals' native haunts are reproduced. The animals themselves are carefully mounted on specially modelled forms and are presented in life-like attitudes carefully studied from animals in the field. Even the footprints of the deer in the snow, or the smears of mud from the wallow in the marsh, are complete and the illusion is so perfect that it is impossible to believe that photographs taken from the groups were not made in the open. These exhibits are unquestionably the finest of their kind found anywhere in the world today, surpassing even the similar groups of the Natural History Museum in New York or the Chicago Museum.

The groups are arranged on either side and at the end of the exhibit hall. In the mammal collection there are six compartments on either side, some 25 feet long by 13 deep. The background is semi-circular to keep the illusion of the picture, the top covered by a ground glass skylight, and a great pane of plate glass shielding the exhibit from the observer. At the end is the largest group of Rocky Mountain sheep, and in

The new type of museum illumination does away with reflections in the glass case and permits you the illusion of looking out into the open. This is not a clever snapshot taken in the mountains, but a time exposure of a "habitat group." The lighting is done through a skylight above which diffuses the light and does away with shadows.



A sunset scene which depends for its effect wholly upon artificial illumination. The skylight above gives the effect of daylight, but the light comes from two 500 watt lamps. Note the box screen at the side, which conceals a lamp and reflector focussed on the sunset to enhance the radiant effect.



the center of the hall are flat exhibit cases containing butterflies, shells, and other groups of scientific interest.

It is obvious that the main object of the illumination is to light the picture groups so that they will appear as windows through which the observer looks out into the open. At the same time it is necessary for the main hall to be sufficiently light to permit of the adequate examination of the center exhibits. The main difficulty lies in the balancing of this illumination so that no group is so lighted as to be reflected in the glass of the exhibit opposite, and the spectators are sufficiently in darkness so that they themselves are not mirrored in the exhibit they are facing.

In the daytime this result is obtained by the effective use of skylights. A double system of skylights—a small one arranged some four feet above the large one—over each group, obviates the possibility of sunlight falling directly on the animals, which would fade them rapidly, and at the same time provides for an adequate diffusion of light without shadows more than would be found in the open. The lighting of the main hall is by means of a narrow central skylight which provides just light enough not to have the central objects reflect in the glass of the exhibits.

This effect is duplicated at night. Above each habitat group two 500 watt Mazda lamps with wide, flat reflectors are placed, located just to the rear of the upper skylight so as not to cast shadows or interfere with the daylight illumination, and yet to give the effect of the rays of light falling at practically the same angle as during the day. The fixtures are constructed of metal with the inner surface painted white, so arranged that they are above the point of sight from the railing in the exhibit room. The carefully gaging of the strength of illumination and the diffusion of the light through the second skylight of ground glass is so successful that it is almost impossible to tell when the lights are turned on in the late afternoon except for a general brightening of the scene. Experiments as to the color of lamp used or possibly the type of medium through which the light should fall to produce the proper daylight effect, were carried out without much success, and finally the ordinary type of

lamp was adopted which, fitted through the skylight, very successfully produced the daylight effect.

The main body of the exhibit halls at night is lighted from a series of lamps concealed in troughs just above the moulding. The shape of this trough is so planned that there will be an even diffusion of light over the entire ceiling with the lamps in a vertical position and so arranged that they cannot be seen from the floor line. The inner surface of the reflector is painted with several coats of white enamel and reflects a subdued illumination which is adequate without being too intense by comparison with the groups.

Artificial illumination, providing it can be made to bring out proper color values and not to cast shadows, has certain advantages over the daylight. It can be maintained always at the same intensity, and it does not fade the skins of the animals, a feature of considerable importance where many of the specimens are impossible of replacement. It has also the further advantage of adaptability for spectacular features.

This is made use of in the latest and perhaps the finest group to be added to the collection, that of the ducks and geese of the Los Banos country. This is a sunset scene, showing the marshes and the distant hills in the sunset light. A line of geese is flying into the picture and alighting in the foreground among the other groups of birds. The illusion of reality is particularly fine in this picture. The subdued light is that of sunset, and it seems almost as though the glow radiated from behind the hills. As a matter of fact, to a certain extent it does. The entire scene is artificially illuminated, and besides the lamps above, properly subdued to give the evening effect, a special lamp with a reflector and a concealing shield, is hidden at the side of the picture and focussed directly upon the sunset so that this portion of the sky is actually brighter than the rest.

The museum is incomplete, the present building representing only one wing of what the final building is to be. The conduits running from the city street through the park to the main cut-off are planned to be of a size sufficient to install the wires for a building of three times the size today. Besides these additions planned, the Academy of Sciences has recently been

left \$250,000 through the generosity of the late Ignatz Steinhart for the purpose of equipping an aquarium to show the marine life of the Pacific Ocean, the richest in marine life of any body of water of the globe. The illumination of this building when constructed, with the proper lighting of tanks for night-time display, will call for the greatest ingenuity and skill. Museum methods are constantly improving—and with them the systems of lighting and the more efficient use of artificial illumination.

A PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(In this primer of inductive interference, the author gives us the essential elements of one of the most difficult problems which confronts users of parallel lines for electric service. The principle in simple terms is that of the transformer. How it is possible to neutralize the induced current by transpositions of wires in an all-metal circuit and the difference in the problem when the current is returned through the earth, is here pointed out. The author served as special investigator with the Joint Committee on Inductive Interference in their study of this problem.—The Editor.)

The first article discussed the fact that two electric circuits running side by side can be considered as primary and secondary of a transformer, with respect to magnetic induction (the current in one circuit due to variations in the magnetic field set up by current in the other). A trolley circuit paralleling a telegraph line was used for illustration.

Evidently the same analogy holds where the earth return is replaced by a wire or wires, as in an all-metallic circuit. However, when both sides of the circuit are metallic, the two (or more) wires can be interchanged, or transposed, so as to neutralize the induction in one portion by that in another. Thus, in

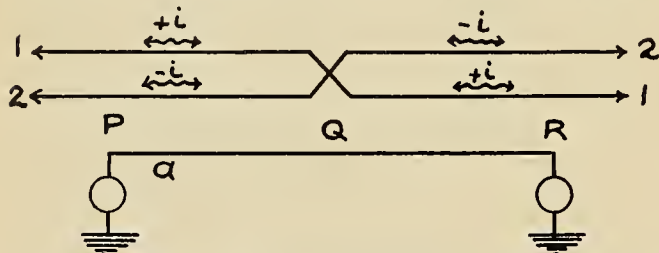


Fig. 1.—A two-wire circuit uniformly exposed to a single-wire circuit with an earth return

Fig. 1 we have a two-wire circuit uniformly exposed to a single-wire circuit with earth-return. This might represent either a telegraph circuit, paralleled by a two-wire power circuit, or a single-phase trolley circuit paralleling a metallic telephone circuit. With the transposition placed in the two-wire line at the center of the exposure the induction in the one half opposes that in the other half, and the resultant disturbing effect is reduced to zero (neglecting minor auxiliary effects, which in practice make it necessary that the length of exposure in which the neutralization takes place be short).

To examine the matter more closely, consider the two-wire circuit to be a power circuit with current $+i$ in wire 1, and $-i$ in wire 2. Due to the interchanging of position of wires 1 and 2, the inductive effect of wire 1 with current $+i$, from P to Q is neutralized by that of wire 2, with current $-i$, from Q to

R. Likewise the inductive effect of wire 2 from P to Q is neutralized by that of wire 1 from Q to R. Another way to look at it is to note that the transposition causes wires 1 and 2 to occupy the same average position from P to R, with respect to the disturbed circuit, "a."

It can also be shown that if "a" be considered as the disturbing circuit, the inductive effects along wires 1 and 2 are equal, and that they tend to cause currents in opposite directions through the circuit having wires 1 and 2 as its sides, which neutralize each other. In any case, the important principle is, that where either the disturbing or disturbed circuit (or both) are all-metallic, transposition of the wires makes it possible

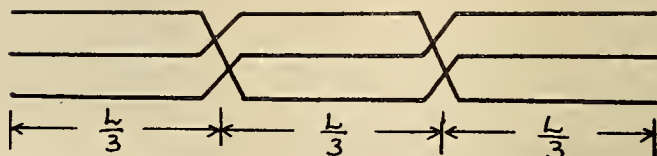


Fig. 2.—A simple method of transposing a circuit having three wires

to produce mutually neutralizing effects in adjacent portions of the exposure. Fig. 2 shows the simplest arrangement for transposing a circuit having three wires.

In a circuit having wires for both its sides, as 1-2 of Fig. 1, the wires are ordinarily within a few feet of each other, and the inductive effect of the current in one side is partially neutralized by that of the equal and opposite current of the other side of the circuit, even where the circuit is not transposed. It has been found by experiment that the current in the earth goes well below the surface. Thus the magnetic induction with an earth-return circuit is such as would be experienced if the earth were replaced by a wire at a depth of several hundred feet. The neutralizing effect of the earth-current is therefore much less than when the circuit is completed through a wire, unless this wire is at a great distance, as in the case of some "single-wire" series street lighting systems. Consequently, earth-return circuits are much more susceptible to inductive disturbance than metallic circuits.

The entire discussion thus far has dealt with magnetic induction, resulting from the current in the disturbing circuit. It is proposed to discuss next the effects of the voltages, or potential differences, of the disturbing circuit.

ELECTRICAL ENTERPRISE IN JAPAN

Electrical enterprises are not marked by any boom, but a fairly steady development is being made, according to the Japan Advertiser, which quotes the electrical bureau as stating that at the end of November there were 674 electrical enterprises in the country and the funds invested in them amounted to 680,886,899 yen (\$339,422,119).

Compared with the corresponding time last year, there is an increase of 50 in the number of enterprises, and of 23,539,737 yen (\$11,734,559) in the combined capital. The power supply, too, shows an increase of 131,706 kilowatts. In this respect it is noted by the Advertiser that the supply from steam power plants shows a larger increase—73,163 kilowatts—while the increase in water power is 58,543 kilowatts.

WOMEN IN THE INDUSTRY

(Woman's sphere used to be confined to the home, but the world is beginning to recognize that she has a responsibility to the outside world as well—and that even in the home the woman is an essential part of business. This recent convention of salesmen's wives called by the employer of the salesmen is but one of the signs of a time which is granting more to woman by the way of rights—and asking more in responsibility.—The Editor.)

A CONVENTION OF SALESMEN'S WIVES

In view of the suggestion of putting wives to work in the place of husbands who go to war, the recent convention of the wives of salesmen connected with the National Cash Register Company at Dayton, O., as reported in *Forbes' Magazine*, is latent with possibilities.

The basic idea was to give the wives an insight into the business of their husbands, to show them exactly how cash registers are made, to explain to them how they could actively aid their husbands in promulgating the introduction of cash registers into stores, and to so familiarize them with their husbands' affairs



An assemblage of wives who met to learn their husbands' business

that they would go back better help-mates, more intelligent companions and more sympathetic critics.

The results astounded everyone. There were lectures, there were visits through the plant, there were pageants, and there were playlets built around the cash register; there were illustrated talks, moving picture entertainments, concerts, drives through the country, talks by executives and addresses by notables from various parts of the country.

From the time a delegate left home all her cares were looked after by the company. Each woman knew exactly what hotel to go to and which room she would occupy. Each one was given a badge with her name printed on it so that introductions were unnecessary. The name of each delegate was printed and hung on the back of the chair she was to occupy in the great hall of the company. A beautiful portfolio, to hold papers and containing writing paper and postcards, was handed to each, also with the name printed on it in gold. A tiny newspaper was issued every morning and distributed to all. On the trips through the factory, as the visitors entered each department they were handed an illustrated card telling the number of

employees and describing briefly the work being done. A booklet was printed giving the name and home address of every delegate and her address while in Dayton. And each day every woman knew where to find her place in the company's spacious dining room.

The whole plant of the cash register company is dotted with mottoes year-in, year-out. One giant placard gave a list of things the wife of a salesman can do to help her husband. They are not inapplicable to other wives! Here are some of them:

Serve simple food.

Keep him cheerful.

Give him plenty of fresh air.

See that he gets plenty of sleep.

Lend encouragement at the right time.

Take a real interest in his sales record.

Encourage him to take regular exercise.

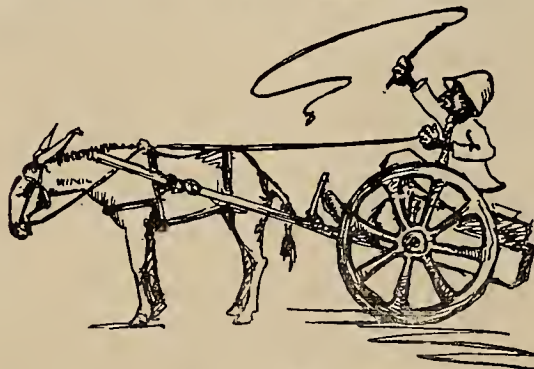
Be economical and save for a "rainy day."

Study merchants' needs and help with "tips."

At its close, one of the local newspapers thus summed up its significance: "The convention is over, but from all indications its effect will be felt for months and years to come. A small army of women—all leaders in their own communities—are today on their way to their homes in all parts of the United States and the Dominion of Canada. They are carrying back with them thoughts and ideas which they will promulgate among their friends, neighbors and members of their women's clubs, to the end that a greater degree of co-operation will be established between womenkind and the Government; they will use their influence to make every housewife in their community understand the emergency which confronts our country and conserve food and materials which are so badly needed in the successful prosecution of the war."

Mr. Patterson announced that he was so convinced of the value of the experiment that he proposed to make conventions of the men's wives a regular feature of the company's activities.

ELECTRICAL TERMS ILLUSTRATED—IV



Plugs and Switches—

have their legitimate place—but for delivery purposes, use an electric truck.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(There is no question but that the public utility should be permitted to share in the prosperity which it helped to create, but if the principle of recognizing this appreciation in value as a legitimate part of the rate base is accepted, the question is where to stop. In order to do full justice to the utility which renders just as great a service but does not perhaps possess appreciating property, an allowance should be made in the earnings for participation in general prosperity. The author is the well-known consulting engineer and expert on valuation problems.—The Editor.)

APPRECIATION IN RELATION TO RATES

The value of an income producing property is ordinarily determined from its earnings. As its net earnings increase its value increases. There may be a material increase of value, therefore, without any increase of investment. The earning power of public utilities, as a general rule, if rates remain stable, increases as population increases, although not necessarily in the same ratio. The appreciation or increase of value which results when net earnings, in their relation to the investment, are increasing follows no definite law and it cannot be forecast with that degree of certainty which can, with some reason, be claimed for depreciation. Just as depreciation represents a loss so does appreciation or increase of value without increase of investment represent a gain. It is an unearned increment which results from the changing conditions of environment.

Usefulness in service, and therefore value, does not always decrease, but may sometimes increase with age. This may be the case with a dam, or with a railway embankment which become more dependable with advancing age. Increasing value may also result from an advance in the price of labor and materials, or from changes in the conditions under which an enterprise was first established which would render more expensive the construction or establishment of the enterprise under the altered conditions.

Stated broadly, values as expressed in terms of money are increasing. This applies not alone to the value of real estate and water rights and like properties, but also, the same condition of serviceability being assumed, to physical elements generally, and to intangibles. It is also true that, as a general rule, public utilities are to be included among the principal factors which are responsible for the growth of communities, and that when viewed in this light, the owners thereof are entitled to participate in the unearned increment or in the general prosperity just as the land owner participates. They do so, of course, as their business increases, but if held down to earnings which will only yield the ordinary interest rate on safe investment or only the interest at which, for use in similar enterprises, money can be borrowed, the extent of sharing in the general prosperity may fall far short of the rate at which values generally, and particularly land values, are advancing.

Such considerations, although not thus expressed, have led the United States Supreme Court to hold that the owner of a public utility is entitled, in most cases at any rate, to have the present value of his property made the basis of the computation when rates are to be fixed. In the Consolidated Gas Co. case (Wm.

R. Willcox et al. vs. Consolidated Gas Co. of N. Y., 212 U. S. 19), the court says:

"And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property which legally enters into the consideration of the question of rates has increased in value since it was acquired, the company is entitled to the benefit of such increase. This is at any rate the general rule. We do not say that there may not possibly be an exception to it where the property may have increased so enormously in value as to render a rate permitting a reasonable return upon such value unjust to the public."

If this view be accepted, as it is by those who consider rate-base and present value synonymous, the question is where to stop. Must this matter of adding appreciation and allowing a return thereon as though it were additional investment go on forever? If this is the theory its application will hasten universal public ownership of public utilities. Should not a limit be set and thereafter the rate-base remain unaffected by appreciation? The allowance for appreciation, or better, an allowance for participation in general prosperity, should then appear in the earnings. The owner should be allowed a fair amount of current appreciation with which he may do what he pleases, and the public will hold down the rate-base to what is estimated to be the properly invested capital at the time the rate-base was established. The court has apparently overlooked the fact that an unearned increment can be thus allowed in the earnings, and that if thus allowed the public utility which has no appreciating real estate will fare as well as those public utilities which own large areas of land or other appreciating properties.

In weighing the question whether or not appreciation is to be added to the rate-base, consideration may be given to the alternative of the rental value of equivalent property. Suppose for example that among the properties owned by a public utility there is a large tract of land located in a region in which real estate values are advancing normally. If instead of acquiring this land the owner of the utility had entered into a lease thereof based upon an agreement that the rent from year to year should be commensurate with a proper valuation of the land, the amount of the rent increasing from year to year would be included in the cost of operation and rates would be fixed as though, in the case of actual ownership, the rate-base had included appreciation.

While by such reasoning a sound foundation may be laid for the inclusion of appreciation in the appraisal of the rate-base, there will always be some cases in which appreciation has been so great that it

would be unfair to the rate-payer to let the full benefit thereof go to the owner of the utility. Why should not the public, and particularly the rate-payer, be allowed to participate in a measure in the unearned increment which is the result of general prosperity and development of resources and, therefore, in part attributable to the presence of the rate-payer? Not only may such questions be asked, but it will be proper to consider that while it may be a simple matter to determine from time to time the appreciating value of land, this may be difficult and uncertain in the case of other kinds of property.

The difficulty of conforming to the decision of the United States Supreme Court in the matter of allowing the appreciation of real estate was felt by the Interstate Commerce Commission of the United States, which says in its opinion in the Western Advanced Rate Case (20 I. C. C. Rep. 344, decided February 22, 1911):

"Certainly if the Supreme Court may decline to lay down the absolute rule that 'in every case failure to produce some profit to those who have invested their money in the building of a road is conclusive that the tariff is unjust and unreasonable' (Reagan vs. Farmer Loan and Trust Co., 154 U. S. 412), it is a conservative statement of the law to hold that a railroad may not increase the rates upon a number of commodities solely because its real estate has risen in value."

"While it is evident, therefore, that each case must be decided upon the facts peculiar to it, the Commission believes it proper in this case to follow the general rule, as stated by Judge Hough of the United States Circuit Court (Consolidated Gas Co. vs. City of New York et al., 157 Fed. Rep. 849, 855), 'Upon reason, it seems clear that in solving this question the plus and minus quantities should be equally considered, and appreciation and depreciation treated alike.' * * * Thus land has been taken at its fair value and not at its original cost, and the annual appreciation of land has been treated as a profit. By this method all property is treated absolutely alike, as Judge Hough suggests. No difference is made, except that as depreciation represents a decrease in assets, it is placed as a debit against operation, while appreciation is placed as a credit because it is 'an increase in assets.'"

The difference between the ordinary treatment of depreciation and of appreciation results from the fact that in the case of depreciation, which is continuous and can be estimated, a definite annual allowance can be made in the earnings to offset it, while in the case of appreciation, which cannot be estimated from year to year, it is not ordinarily treated as revenue. When the occasional appraisal discloses appreciation it is treated as profit. The Interstate Commerce Commission believes that depreciation and appreciation should be treated alike. The United States Supreme Court holds that the owner of the public utility is entitled to the appreciation unless the same is excessive in amount. It would be much simpler, as already stated, to grant to the utility, after a rate-base has been properly determined, some reasonable share in the general prosperity not measured solely by the value increase of real estate and other property, and preferably brought into some relation to the volume of business instead of to the rate-base. Under the ruling of the courts, however, in determining present value there is no escape from a consideration of reproduction cost and the reproduction cost will include appreciation. Under this ruling all relation between actual original cost and permissible earnings may be lost. When the

courts shall have accepted the view that "fair value" is not the proper starting point, then the importance of making close estimate of cost of reproduction, which includes both depreciation and appreciation, will fall away.

PUMPING ON IRRIGATION PROJECTS

In a recent number of the Irrigation Record, Jas. M. Gaylord, electrical engineer in the Reclamation Service, points out some of the factors in pump installations for irrigation purposes. With the continued development of irrigation projects the pumping of water is becoming more and more important. Many of the more desirable gravity projects have been taken up and future development turns more and more to power as a means of putting water on the land. In some cases an entire project or unit is irrigated by pumping; in others high land exists as an isolated area in the project or at the borders of a project and a small pumping plant is desired for an individual ranch or group of ranches. Pumping from wells is practical in many places, and some large areas are entirely dependent on this source of water supply. Drainage pumping is also requiring more and more attention as continued irrigation increases the necessity of drainage.

The centrifugal pump is most commonly used in irrigation work and in its various styles is adapted to a very wide range of conditions. This type of pump is simple and has few parts, but its very simplicity often leads to waste of power as the operation may appear almost perfect, whereas in reality the efficiency may be very low.

The efficiency to be obtained from centrifugal pumps has been greatly increased within the last few years and it is now possible to obtain efficiencies of 60 to 80 per cent, where formerly 25 to 50 per cent was the rule. Increasing the efficiency effects a proportional reduction in the power bills and it is of great importance to make sure that the pump is operating under conditions of maximum efficiency.

The centrifugal pump is not very well adapted to very low lifts, namely, less than 10 or 15 feet. A type of pump which is designed to meet the conditions requiring large quantities of low lift is the screw pump. The Reclamation Service is installing two screw pumps on the Yuma project, where they will be used to pump drainage water into the Colorado River.

For still lower heads, from 1 to 5 or 6 feet, a very satisfactory and efficient pump is the scoop wheel. This pump is constructed after the fashion of an undershot water wheel reversed and driven by a motor. Some very successful pumps of this style are in use on the Minidoka project, where efficiencies of over 70 per cent have been obtained. These wheels are built principally of wood, only the shaft and gearing being of metal. They are cheap to build, and the small power requirements, little attention required, and freedom from expensive repairs make their operation very economical.

In general it may be said that the success of a pumping plant depends upon accurate determination of the physical data, the selection of apparatus adapted to the conditions, and systematic attention to the details of the operation and maintenance of the equipment.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(The importance of water use to the electrical man—both as a source of power and in its application to irrigation with the growing use of electric pumps, makes it essential that he possess a knowledge of water rights and laws. Recent decisions and interpretations of the law in the West are here given. The writer is an authority on the subject and the author of a new book on Western Water Law which is now available for distribution.—The Editor.)

WATER RIGHT AGREEMENT UPHELD

West Side Irrigation Co. v. United States, 246 Fed. 212

One of the many benefits flowing from the operation of the Reclamation Act, in addition to the actual construction of large irrigation projects, has been the harmonizing of other interests on the same water system. The Sunnyside project of the Reclamation Service is situated in Central Washington, in the Lower Yakima Valley. A number of canal systems diverted water from the Yakima Valley above the Sunnyside Canal, which was purchased by the United States. The service aimed to very materially increase the low water flow of the Yakima by storage in lakes on its upper reaches. In order to assure the Sunnyside project a safe water supply, however, it was necessary in some way to definitely determine the rights of the upper canals. After much negotiation it was decided by the parties in interest that an agreement should be executed by each canal company, limiting its water supply to a specified amount during the irrigation season.

One of the canal companies entering into the agreement was the West Side Irrigation Company, which was limited to 80 cubic feet per second from April to September inclusive, and to 34 cubic feet per second during October. The agreement was executed in October, 1905. After the construction of the Sunnyside project the West Side Company diverted in excess of the stipulated amount, and suit was entered by the United States to enjoin it from so doing.

Settlement of water rights by agreement in this way was entirely novel at the time the agreement was executed. There was considerable doubt as to the legal sufficiency of such agreement, principally on account of the lack of material consideration. The United States Circuit Court of Appeals, however, in this case has upheld the contract. In answering the argument that there was lack of consideration, the court held that the company and others entering into the agreement had "received the benefit of the adjustment of all conflicting water rights and the benefit of the expenditure by the United States of a large sum of money in the county in which their lands are situated; and, on the other hand, the United States, relying upon the agreement so made, entered upon the execution of the reclamation scheme and therein, at the time of the commencement of the suit, had expended for construction and reclamation \$6,866,500."

Among the many points presented by counsel for the company was the argument that there had been a mistake in regard to the quantity of water; that the stockholders of the company had been using 4000 inches of water under their method of measurement, and that in executing the contract they thought they

were securing the equivalent thereof in being allowed 80 cubic feet per second. It contended that the 4000 inches were in reality equivalent to 90.4 cubic feet per second. The court held, however, that the evidence was not sufficient to sustain the contention that the stockholders and officers of the company did not understand the expression used in the contract. This case is but another of the many controversies constantly arising from the use of the unit "inch"—a unit which not only varies from state to state, but very often from community to community.

INDIAN RIGHTS IN THE USE OF WATER

Byers v. Wa-Wa-Ne, 169 Pac. 121

In determining the rights to the use of the waters of the Umatilla River in Oregon, an interesting point was presented as to the right to water of a flour mill as against the rights of the Umatilla Indians.

In 1870 the agent in charge of the Umatilla Reservation issued a permit to certain parties to construct a ditch across part of the reservation to take water from the Umatilla River to the city of Pendleton. The rights acquired under the permit subsequently passed to Byers and the water was used to supply power to a flour mill at Pendleton. The Supreme Court of Oregon in this case has made a careful analysis of the original treaty with the Umatilla Indians, as well as the later congressional acts in regard to the reservation and allotments to the Umatilla Indians. Beginning with 1884, a number of attempts were made to pass an act confirming the water rights of the Byers mill, which then rested upon the authority of the revocable permit only. In 1885, a congressional act was finally passed confirming the Byers water right, with the following proviso:

"Provided, that this act shall in no way impair or affect any existing right to a reasonable use of the water of said stream for agricultural purposes, nor shall confirm or grant any right to use the water thereof in any manner nor to any extent beyond or different from that to which it has been heretofore appropriated."

It was this proviso which caused the most serious discussion in the present case. The court held that the rights of the Indians are paramount only to the extent of water which they require for household use and the watering of live stock, and that with this qualification, the rights of the Byers mill are superior and paramount to those of the United States, as guardian of the Indians.

The decision is of unusual importance for the reason that many attorneys hold that "the mere creation of an Indian Reservation by treaty impliedly secures to the Indians all water in streams which touch the reservation which they may at any time desire to put

to a useful purpose." This idea is founded upon two decisions by the United States Supreme Court dealing with Indian Reservations in Montana, in each of which cases the title of the Indians to the use of water was held to be superior to that of upper users, even though the latter had used water for a number of years, and the Indians had used none.

It is clear from the opinion in the present case that all the circumstances surrounding the particular case must be weighed, and that no sweeping rule can apply.

CALIFORNIA MUNICIPAL WATER DISTRICT ACT HELD VALID

Henshaw v. Foster, 169 Pac. 82

The case deals with an attack upon the constitutionality of the Municipal Water District Act, approved by the California Legislature May 1, 1911, and later amended December 24, 1911, and May 29, 1915. Certain owners of land in San Diego county brought this action to enjoin the Board of Supervisors of the county from calling an election for the purpose of determining whether or not a district to be known as the San Diego Municipal Water District, should be incorporated under the provisions of the act. The district, as outlined in the petition, includes land not now within any municipality, as well as the territory of three incorporated cities—San Diego, East San Diego, and La Mesa, and that of one irrigation district, known as La Mesa, Lemon Grove and Spring Valley Irrigation District.

The plaintiffs contended that the act is in violation of a number of constitutional provisions, principally dealing with the powers and privileges of existing municipalities. It was argued that the inclusion of the three cities within the district would result in "an intolerable clash of authority between the governing bodies of these municipalities and the trustees of the water district." The inclusion of the La Mesa, Lemon Grove and Spring Valley Irrigation District was also contended to make the formation of the district invalid.

The Supreme Court of California, however, upheld the validity of the act and all the proceedings on every ground of attack.

PORTLAND GALVANIZING WORKS

BY F. D. WEBER

The new wooden ship of 3500 to 4000 tons contains approximately 150 tons of iron and steel, which must be galvanized. In the past this galvanizing was done in the Eastern part of the United States, but now there is a great demand to have this work done in the immediate vicinity of the construction yards. As a consequence of the close proximity of the Portland Galvanizing Works to the shipbuilding centers of the West, their business is expanding rapidly.

About five years ago this plant was established, and one man and a boy handled all the work turned out. Now the force consists of forty-five employees, and two shifts are run.

Two processes are handled at this plant—electro-galvanizing and the hot-dip process.

For handling the electro-galvanizing process there is installed one 15 horsepower, 220-volt, 3-phase, 60-

cycle induction motor, direct connected to a 1500 ampere, 5-volt direct current generator. Also a 10 horsepower, 220-volt, 3-phase, 60-cycle induction motor drives a rotating plating barrel, and a 200-ampere, 15-volt direct current generator for the copper shop.

Before a metal can be properly galvanized it must be thoroughly clean, and for this purpose it is treated by an electro process of cleaning (the reverse of plating) or treated with dilute sulphuric acid.

After being thoroughly cleaned, the metal to be galvanized is suspended in tanks of sulphate of zinc solution with the electric current flowing for 45 minutes to one hour, when the metal is removed and brushed with steel brushes and water and again subjected to the galvanizing bath. This process can be repeated as many times as desired, if between each coat the metal is well brushed with the steel brushes and water in order to make each coat adhere.



The three new buildings of the Portland Galvanizing Works

Small parts, such as nails and screws, are handled in baskets, and scrubbed in rotating cylinders.

In the hot-dip process the metal is thoroughly cleaned by boiling in sulphuric acid solution and scrubbing, by means of a rotating sand blast barrel, or by the use of a stationary sand blast apparatus. After the metal has been cleaned it is dipped, by means of small hand cranes, into a molten zinc bath, the temperature being about 850° F.

The rotating sand blast barrel is driven by a 12 x 10 air compressor, which in turn is driven by a 50 horsepower, 220-volt, 3-phase, 60-cycle induction motor. This apparatus is an immense cylinder, in which the metal is placed and inside of which there are four sand blast nozzels so directed that they cause the cylinder to rotate while the cleaning process is going on.

The compressed gas is furnished by two compressors driven by 5 and 10 horsepower, 220-volt, 3-phase, 60-cycle induction motors.

After the metal is galvanized and removed from the galvanizing kettles, all drops of zinc on the edges are wiped off and all black spots scrubbed off with a brush and cold water.

The future of this new industry in Portland depends upon the shipbuilding industry, and at present prospects look very bright.

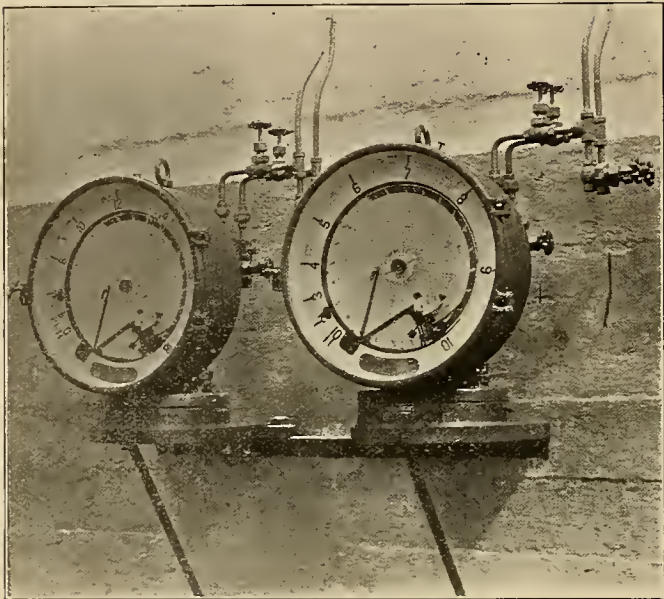
FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Economy in steam power generation, where oil is used as a fuel, demands the careful study of the steam that is diverted for use in atomization of the oil. Here are some suggestions as to how this steam may be measured quantitatively. These suggestions, among others, are being embodied in a book on the elements of fuel oil and steam engineering by the authors, profusely illustrated and composed of over three hundred pages, that will be available to the trade April 1, 1918.—The Editor.)

MEASUREMENT OF STEAM USED IN
ATOMIZATION

As has been previously set forth, there are three methods used in pulverizing or atomizing the fuel oil in the industries for heat generating purposes, namely :



A Typical Steam Meter

by compressed air, by steam, and by some mechanical operation.

In any one of these instances the actual expenditure of energy necessary to accomplish this result when converted into heat units should be charged as a loss in furnace operation, when the efficiency of the boiler as a whole is being determined. And if this energy is taken from the steam that is being generated in the boiler, then the net steam energy should be computed by subtracting from the gross production such steam as may be used in atomization.

It then becomes the task of the steam engineer to construct some accurate and convenient apparatus whereby this may be easily and accurately accomplished.

There are steam meters on the market that may be utilized for this purpose, and if a careful design is picked, the measurement may be relied upon. Many engineers, however, prefer the use of a standardized orifice or the construction of an apparatus of their own whereby this important data may be ascertained with accuracy.

Mathematical Expression for Flow of Steam.—In the mathematical considerations involved in establishing a formula for steam flow through orifices, a rather unique incident is encountered. When the pressure of the lower medium into which the steam

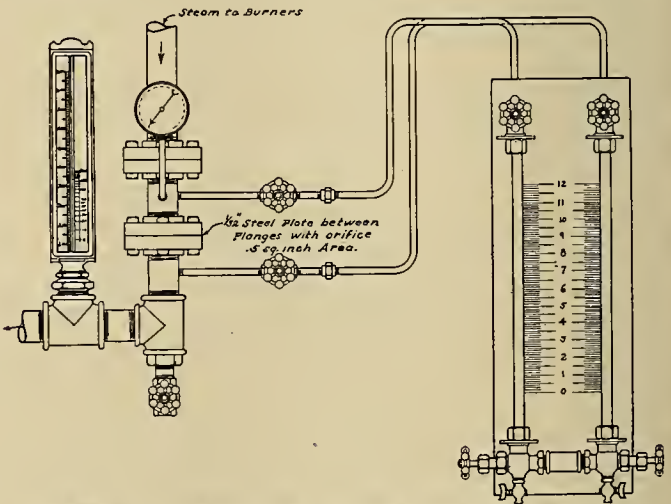
empties itself is less than 58 per cent of the higher pressure, a certain formula applies. And the rather remarkable thing is that below this point the flow is neither increased nor decreased by a reduction of the external pressure, even to the extent of a perfect vacuum. This was the basis upon which Napier's formula was derived in the article on Steam Calorimetry, wherein a formula was given to compute the steam utilized for operating the calorimeter. In this formula it was seen that, if W is the weight of the steam in pounds per second flowing into the atmosphere, p the absolute pressure in pounds per square inch in the steam main, and a the area of orifice in square inches, we have

$$W = \frac{pa}{70} \dots\dots\dots (1)$$

For steam flowing through an orifice from a higher to a lower pressure where the lower pressure is greater than 58 per cent of the higher, we have the formula

$$W = 1.9 AK \sqrt{(P - d)d} \dots\dots\dots (2)$$

wherein W is the weight of steam as discharged in pounds per minute, A the area of orifice in square inches, P the absolute initial pressure in pounds per

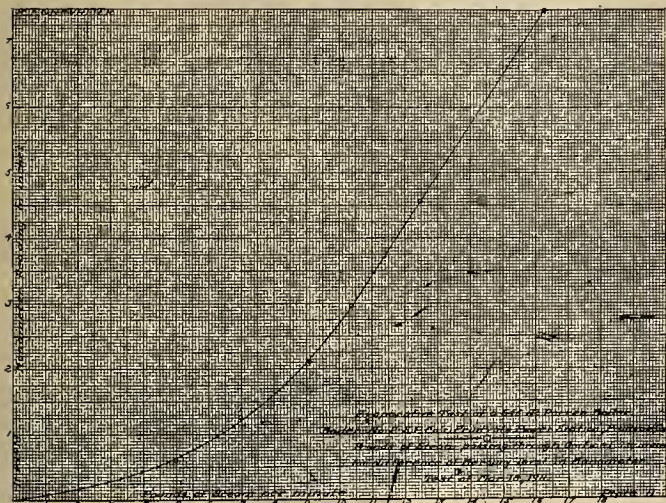


APPARATUS EMPLOYED IN MEASURING STEAM IN
ATOMIZATION

The flow of steam through an orifice wherein a slightly lower pressure is maintained on the further side of the orifice, is found experimentally to be proportional to the difference in mercury heights indicated on the manometer shown on the right in the illustration. By calibrating these readings prior to a test the steam used in atomization may be conveniently and readily determined during a test.

square inch, d the difference in pressure between the two sides in pounds per square inch, and K is a constant which has a value of .93 for a short pipe and .63 for a hole in a thin plate or a safety valve.

This latter formula is applicable in the measurement of steam to burner utilized in the atomization of fuel oil. In the following lines a method will be outlined setting forth the necessary apparatus involved in determining the variables in the formula. Instead of actually substituting and solving numerically, however, it is far simpler to construct a chart and pick from this the steam consumption for any given steam pressure and pressure difference in an orifice placed in the main.



CALIBRATION OF ORIFICE FOR MEASUREMENT OF STEAM USED IN ATOMIZATION

Previous to a boiler test the manometer which registers the pressure difference at the faces of the orifice is carefully calibrated by condensing the steam flow and weighing the hourly condensate. These data when plotted on a curve as shown above enable the engineer to quickly ascertain the steam used in atomization at any time during a test.

Here then is presented a ready and accurate means of steam measurement for atomization purposes. A diaphragm with an orifice opening of .5 of a square inch in area is inserted in the steam line. On both sides of this diaphragm are drilled holes which are tapped for a $\frac{1}{4}$ -inch pipe. The pipes are then connected to both legs of a manometer filled with mercury. A manometer is nothing more nor less than a U-tube filled with mercury. When these two ends are connected with pipes of varying pressures, the mercury in the U-tube will of course be raised to a higher point in one leg of the U-tube than in the other. The difference in this height represents in inches of mercury the difference in pressure between the two sides of the diaphragm. If now a steam gauge be inserted in the steam main on the boiler side of the diaphragm, we are enabled by means of the atmospheric barometer reading to express these pressures in absolute pressure units as set forth in the chapter on pressures. On the burner side of the steam main a thermometer is inserted as shown in order to measure the temperature of the steam fed to the furnace, as this steam in many instances is superheated and hence the pressure reading does not indicate the temperature existing.

A manometer is accurately calibrated prior to the test by allowing the steam to be discharged into a barrel for a period of time under varying manometer readings. A curve is then plotted similar to the one shown in the illustration, which sets forth the pounds of steam passing per minute for any particular mano-

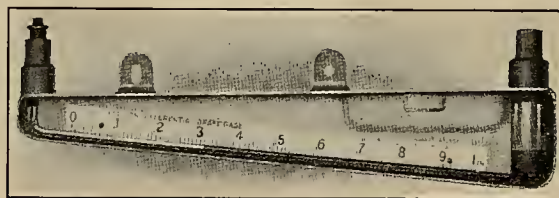
meter reading in inches of mercury. If, then, readings are taken every fifteen minutes during the test, the testing engineer notes at such intervals the steam that has passed during the preceding fifteen-minute period. In such a manner the total quantity of steam used in atomization is ascertained.

Thus in a test at the Fruitvale Station of the Southern Pacific Company, the pressure of the steam at the burner was found to be 168 pounds per square inch. The temperature of the steam at the burner was 440° F., which indicated a superheated condition of 65° F. The total steam used by the burners for a ten-hour test was found by the above means to be 7441 pounds, while the total weight of water fed to the boilers proved to be 180,240 pounds. Hence the percentage of total water evaporated by the boilers used in atomization is determined by dividing 7441 by 180,240, which is 4.16 per cent.

The total weight of oil fired was 14,093 pounds during the test of ten hours. Hence, the pounds of steam utilized for atomization per pound of oil fired is obtained by dividing 7441 by 14,093, which proves to be 0.528 pounds.

The Taking of Boiler Test Data

In previous articles we have touched upon all the important points involved in tests on boiler economy. These, however, have been considered under separate headings and of necessity in a somewhat disconnected manner. In this and the succeeding papers, we shall endeavor to link these items into a connected unit.



THE DIFFERENTIAL DRAFT GAGE

In order to exaggerate the readings of the draft in inches of water, the measuring tube rests on a slope of ten to one in this type of instrument, and thus readings to another decimal point are ascertained which would otherwise be impossible.

The Object.—"What can you do?" applies equally well to the rating of inanimate objects as well as to the accomplishment of human endeavor. And so the object of boiler testing is to try out the latent steaming qualities of the boiler and test its strength both for sudden calls and for endurance. The manner in which the mechanical design of the boiler can withstand such tests and especially the efficiency with which it can perform its function of transforming the heat energy of the fuel into energy latent in the steam sent forth from the boiler are as a rule the factors that either add lustre to the name of the manufacturer or else relegate the type of steam generator under test to the scrap heap.

The Instructions for Boiler Tests.—The minute details that should be satisfied in order to secure accurate data wherewith to rate the boiler and scientifically set forth its commercial worth are elaborately set forth in instructions issued by the American Society of Mechanical Engineers, compiled by their Committee on Power Tests. In any case of actual test, the steam

engineer should be provided with a copy of these instructions, which he can secure from the secretary of the society by the payment of a small fee.

Since these instructions require many pages wherein to set forth the details of a test, it cannot, of course, be expected that anything beyond a general outline of procedure in boiler testing be set forth in this article. Still it has been the experience of the authors that if the steam engineer gets a thorough picture of the test details as a whole he is well equipped, with the assistance of a nearby copy of the detailed instructions, to properly understand the procedure.

The Test for Efficiency Under Normal Rating.—

It has been seen under the subject of Rating of Boilers that the manufacturer or builder rates the output of the boiler on the basis of the boiler heating surface presented to the furnace gases. For each ten square feet of boiler surface so exposed to the furnace gases, the boiler is said to have one boiler horsepower. A test for boiler efficiency under this normal condition of operation is one of the most important to be ascertained in boiler performance. In order to accomplish this result, the steam engineer usually computes the total weight of water the boiler would approximately have to evaporate into steam per hour under the conditions of entering feed-water temperature, boiler pressure, and quality of steam generated to satisfy the builder's rating. Having made a careful estimate of this quantity he then proceeds to operate the boiler as nearly as possible to meet this condition.

Time of Duration of Test.—The generation of steam is maintained as uniformly as possible over a period of from eight to ten hours.

The Beginning and Stopping of a Test.—At the beginning of the test the level of water in the boiler is noted on the water glass and at the completion the water is brought to the same height.

In the testing of boilers fired by fuel oil, the boiler is brought up to and continued at normal operating conditions until the furnace wall and boiler room temperatures are at their normal reading. Then the test is started by feeding weighed water and fuel oil. At the end of the test, all conditions of pressure, temperature and rate of steam generation should be as nearly as possible the same as at the beginning.

The Weighing of the Water.—Several tanks are placed upon carefully calibrated scales and all water entering the boiler from the instant the test starts to its closing point is carefully weighed. The details of the methods involved in the weighing of water have appeared in a previous chapter.

The Heat Represented in the Steam Generated.

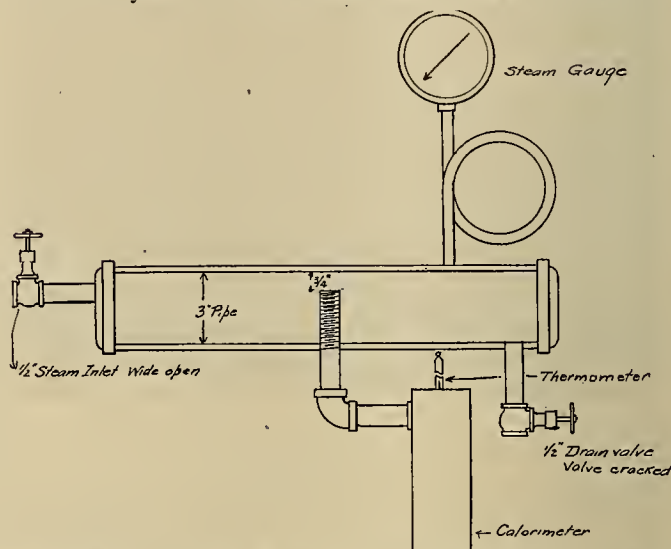
—The temperature of the entering water and the pressure of the steam generated are noted at frequent intervals. The quality of the steam as to whether it is wet saturated, dry saturated, or superheated, is also carefully determined quantitatively by methods outlined in previous chapters.

With these data at hand the steam engineer is enabled by deductions to be set forth in the article on Heat Balance to compute the actual heat energy absorbed by the entering water in the production of steam.

The Oil, Its Measurement and Analysis.—At the same time that the steam generating functions of the boiler are being ascertained, it is of course necessary to weigh the fuel oil admitted to the furnace for firing purposes and to draw frequent samples for the composite sample to be used in ascertaining the heat producing value of one pound of fuel. The method of weighing the oil and drawing the oil sample has been set forth in a previous chapter.

Having determined the calorific value of one pound of fuel by methods previously described the total heat put into the furnace by the fuel during the test is computed.

In former articles are to be found discussions which fully set forth the methods utilized in determin-



A SUGGESTION FOR A STEAM CALORIMETER ATTACHMENT
The throttling calorimeter has found wide application as a means for determining the moisture in wet saturated steam in its application in fuel oil practice. Here is a suggestion for the calorimeter attachment in accord with rules laid down by the Power Test Committee of the A. S. M. E.

ing from the oil sample its calorific value, its moisture content, and its gravity under standard conditions which are necessary to compute the total heat producing value of the oil used in firing the boiler under test.

The Steam Used in Atomization.—In most central station practice wherein fuel oil is consumed for heat generation, the atomization of the fuel oil is accomplished by blowing into the furnace through the oil burner a certain quantity of steam that is being generated in the boiler. To obtain the useful and economic quantity of steam generated by the boiler we should then subtract this steam used in atomization from the total steam generated in the test. A practical method of obtaining experimentally the steam used in atomization has been described in a previous chapter.

The Boiler Efficiency.—Having thus obtained the net heat absorbed by the boiler under test and also the heat given out by the fuel oil sprayed into the furnace, the ratio of the former to the latter gives us the efficiency of the boiler as set forth in the discussion on Heat Balance.

In central station practice on the Pacific Coast the gross boiler efficiency in the best installations ranges from 81 to 83 per cent under test conditions. The atomization of the steam lowers this efficiency by about 2 per cent, thus making the best net boiler efficiencies range between 79 and 81 per cent.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

ELECTRICITY IN MODERN ARCHITECTURE

BY EMMETT D. CHEESMAN

(The enterprising real estate owner not only remodels his old houses by installing electricity, but he builds his new ones with every modern convenience in electrical lighting and heating. It is good business for the apartment house owner, for it means that he will have no difficulty in renting—and it is certainly good business for the electrical man, from the central station to the contractor-dealer, who is beginning to appreciate that the architect and the real estate man are among his best customers. This interesting description of an electrical apartment house is obtained through the courtesy of the Southern California Edison Company.—The Editor.)

Each day takes us farther away from imitating the varied ideas and creations of other periods. New

ideas, shorn of all garnishment and adornment, have brought the realization that simplicity is beauty and that beauty and harmony count for naught when it does not radiate from within us. To this ever-eager spirit of progression and originality and the necessity of practical requirements of modern living conditions we may attribute the electrically equipped home as one of its most artistic and beautiful contributions. Electrical throughout, because as Irving

I. Gill, the architect



The refrigerator that operates automatically by electricity is wholesomely sanitary and there are many good features that become available by its introduction into the home.

expressed it, it was the only means of adhering to the essential ideas of cleanliness and sanitation of his model construction, the West Adams Villa Apartments of Pasadena.

The influences and expressions of different ages are seen in the styles of architecture men have created. There has been the Greek and the Roman; the architecture of the period of the Renaissance and others, each with its distinctive construction, but these styles of architecture have largely been expressions of art, as the result of the influences of certain schools. Now we are in an age of science; of economy and practical art. Modern science, plus the modern idea of simplicity and the fact that after all, shelter and comfort are the principal purposes of the home, has given us

this new style of architecture—the electrically equipped home. So it follows that a Modernist in architecture has departed from the conventional house planning and building and includes the installation of electrical appliances the same as he plans on the installation of plumbing and necessary lighting fixtures.

Mr. Gill, in giving many years to the study of the features of the ideal home, has planned and built seven “homes” of irresistible charm under one roof and made each one perfect in effect of convenience, cleanliness



There are no central fixtures or side brackets in these rooms—all light being furnished by various types of portables which are furnished with the house. Note the electric heater and the glimpse of the electric kitchen in the rear.

and cheerfulness—wholly livable and homelike. There isn't an old idea to be found in the creation of any of these; everything is new and distinctly different and unquestionably the more beautiful for it. The thought given to the minute details in every instance makes one appreciate it in comparatively the same manner as one would the work of a mechanic and a craftsman.

He has thought of the part the rooms must take, individually, making them first, bright and cheerful by daylight, using great care that by night their tone shall not be changed. There are portable pedestal electric lamps with indirect lighting, giving the same soft light that the sunlight gives by day. The elimination of chandeliers and side lighting fixtures causes no breaks in the lines of the walls and ceilings. Electrically heated, there are no furnaces to be fired—the turn of a switch gives a radiant healthful warmth, free from poisonous gases, and the air is pure and odorless. The walls being of concrete and the window frames of metal construction as are all of the doors, which are hung on invisible hinges, there is no waste of heat or draughts to chill the rooms. The floors throughout are of a polished sandstone composition

and when finished resemble rich leather with a play of color that is exquisite. Window sills are flush with the walls and baseboards are eliminated, primarily for the dustless idea, but give an unusual charm, forcibly convincing of sanitation. The tone of the walls is finished so as to reflect the color of every object in the room, responding to all the varying lights. Relative harmony in all these unusual features and electricity show the extremes which have been resorted to, to make this a modern structure in the progression of architecture.

Analyzing the electrical possibilities of such a home, one dwells upon the thoroughness and ease the household duties may be discharged. Artistic women find an interest in the arrangement of their homes and now that electricity has made it possible for them to take the actual work from the hands of the servants, the result is that personality and charm become subtle qualities.

Can one imagine a delicate woman, daintily gowned, sweeping great clouds of dust with a broom? Immediately the daintiness and delicateness fades from the mental picture when you think of the broom and dust, but lo! put a vacuum cleaner in the same hands and dignity and charm are enhanced.

Women have their sphere and needlework and sewing is a natural accomplishment to most of them, but without the electric motor attached to the sewing machine, much of the beauty is obliterated through weariness and labor in operating the machine.

What woman is there who wouldn't long for that wonderful kitchen? It seems the longer you are in it, the more you are convinced that it is an electrical wonder! The electric ranges—built into the wall, no dirt to accumulate underneath the stove, no fuel to bring in to litter up the floors, no burnt matches and most of all, no drudgery about preparing a meal, whether for family or for any number of guests. It's all so simple—an automatic clock arrangement will even make it possible for you to cook your meal while you are shopping or visiting. Days of the housewife be-

ing busier and fuller than ever before, economy in time is of great import, while the saving in food is a patriotic demand.

Mr. Gill has installed two electrical necessities that need no applause to make them popular; their good points are rapidly grasped. One is the automatic electric water heater—"Everhot" is just what it is—hot water that is hot at the turn of the faucet, without having to think to light the heater an hour before it is to be used. The other is the iceless refrigerator—iceless and icemanless. Electrically operated, no uncertain deliveries or mud to be tracked in by careless deliverymen. Food preservation in a sanitary manner is alone a convincing feature.

The happy, cheerful woman of the home is an acquisition to humanity since housework can be eliminated of long weary hours and drudgery and servants. There is more time to be given to the whims and fancies and work becomes part of the day's pleasure and happiness and health prevail where the strain of the old methods of housekeeping are relics of "olden times."

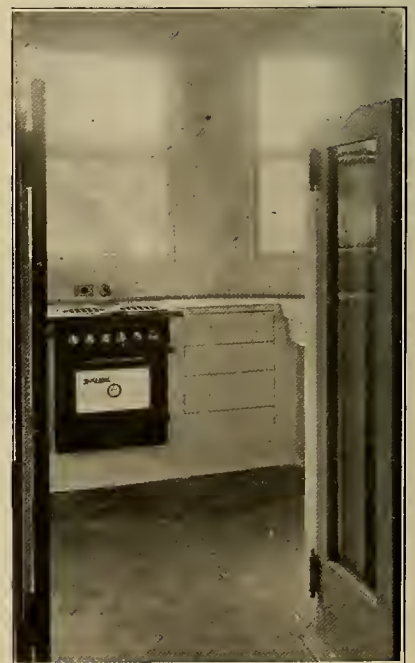
A PROGRESSIVE CONTRACTOR

Sessions & Grey, electrical contractors in Salt Lake, Utah, won the third prize in the Fan Motor Merchandising Contest of the Western Electric Company. This contest was open to all distributors of Western Electric fans in the United States, and it is interesting to note that Sessions & Grey were the only contractors to win a prize. In addition to an attractive window display, they conducted a systematic and effective local campaign in connection therewith, which coincided with the popular magazine advertising of the Western Electric Company.

That this firm is wide awake and alive to present day conditions is further shown by Mr. Grey's article on the subject of small cottage wiring, which appeared in a recent issue of the Journal of Electricity.



The house is really built around its electrical installations. The kitchen, with its electric stove and electric refrigerator, is the particular pride of the architect.



EFFICIENCY AND RETAIL SELLING

BY ELMA STEINMANN

(It may not have occurred to you that the mere matter of how you make your sales is a thing to be studied, but the comprehensive analysis of the selling problem presented here will suggest possibilities of improvement. Efficiency is within the power of the selling end of the business as well as in the factory. Department stores are taking the subject very seriously—but the question is a no less important one to the small dealer who perhaps has only one or two employees. The problem is essentially the same—to sell goods effectively. The author is Educational Director of the Emporium department store in San Francisco and actively engaged in this work.—The Editor.)

This paragraph from President Wilson's proclamation (April 15, 1916), voices the keynote of the efficiency movement. The elimination of all waste is the end in view, for in the final analysis, waste of any sort is harmful. "Efficiency is attained by the use of the best methods for the achievement of the best ideals." Emerson states as one of his twelve underlying principles of efficiency the necessity for a clear-cut and definite ideal.

The science of management is comparatively new. Some of its principles were discovered and applied by Frederick W. Taylor in the Midvale Steel Works within the last half century.

Many people have a superficial impression that "scientific management is useful only to the factory or perhaps to a railroad, because they have heard of it mainly in connection with those fields. It is true that the manufacturing industries were the first to recognize their problem and have much to teach us. The activities of the factory have been analyzed scientifically in their relation to each other. These activities have then been so organized that the best results may be obtained at the smallest expenditure of time, effort and money."

Both motion studies and standardization of tasks and working conditions are being applied to all fields. Science has just as much to do with selling as it has to do with manufacturing, as many of the selling organizations have recognized.

The selling field may be generally classified as "outside" or wholesale selling, and "inside" or retail selling. There is a primal difference between the two fields. The outside or "traveling" salesman or woman must seek the customer—create the demand. The inside or retail salesperson serves a customer who voluntarily enters the store in a buying frame of mind.

This difference is important, for it is probably the reason for the precedence that the outside selling field has taken. The old-time traveling salesman, whose chief qualification lay in his ability to "crack jokes" and entertain customers, is fast

disappearing. Competition is every day becoming keener and the modern dealer, before he gives an order, wants to know facts about the superiority of the article in question, and how it will affect his profits and expenses. For this reason the traveling salesman, too, is studying his problem. He learns all he can about his customer before he approaches him. He watches for every clue. He knows his merchandise from A—Z, its power, and superiority, as well as its limitations, and he studies how to adjust this knowledge to the peculiarities of the customer before him.

In the best organizations salesmen are carefully trained before they are allowed to go out to represent their product. There is a standard of service peculiar to each kind of ware and a man's potential ability must be considered before he can be successfully placed.

But there is a leak in the retail business that is persistently continuing. Good business methods in advertising, merchandising, even a perfect store system will not correct it. The old-time "clerk" of the store, too, must be displaced by a trained saleswoman or salesman.

Large retail institutions like department stores, foreseeing this need, are installing departments of training for the sole purpose of applying the principles of efficiency to their activities. Schools, both public and private, are giving courses of study especially designed to meet the requirements of the retail field. A typical course includes the following subjects:

I. Salesmanship, which should cover: 1. Analysis of a sale. This involves: (a) Approach to customer—getting attention; (b) Showing merchandise—arousing interest; (c) Talking up merchandise—awakening desire; and (d) Closing sale—getting decision. Under Salesmanship also come the headings: 2. Type of customers; and: 3. Demonstration sales for discussion.

II. Merchandise. This includes the subjects of: 1. Stock, its classification, arrangement and display, and its care. 2. Materials and qualities; and 3. Color and design, which is applied practically to arrangement and display and proper color combinations.

III. Business administration, which involves: 1. Principles of management. 2. Organization. This divides itself into: Relation between management and employee; relation between employees; and, relation to customers.

IV. Academic Subjects in Business, covering: 1. Arithmetic; 2. English; and, 3. Geography.

Salesmanship is a fine art. Like all arts, a love of work is necessary for its success. Real salesmanship consists in the ability to sell goods that will not come back, to customers who will.

IT IS evident to every thinking man that our industry on the farms, in the shipyards, in the mines, in the factories, must be made more prolific and more efficient than ever, and that they must be more economically managed and better adapted to the particular requirements of our task than they have been; and what I want to say is that the men and the women who devote their thought and their energy to these things will be serving the country and conducting the fight for peace and freedom just as truly and just as effectively as the man on the battlefield or in the trenches.

—Woodrow Wilson.

Western Ideas

EVEN THE BAGGAGE TAGS of Japan are novel and interesting. This attention to detail and distinction in little things is one of the great assets of Japanese business. The customer is impressed with the high quality of the service rendered and subconsciously pleased with an establishment so enterprising—certainly a most fortunate frame of mind for a prospective purchaser. This unique tag from the beautiful Myako Hotel at Kyoto, which in its red, white and black setting is at once impressive and an excellent attention holder. Why not make use of this novel idea and make your package deliveries savor of taste and novelty. It will place your establishment in the purchasing list of many homes you thought impossible to



Compare this with the ordinary manila baggage tag

enter. Women particularly are pleased with such details. Not one of them but strives for attractive distinction in her home and her dress—and if she could she would trade only in stores which possessed a taste equal to her own.

MAKING THE BILL ATTRACTIVE is a task not usually attempted, but in so far as it is possible in a world of high costs and low wages, this firm seems to have accomplished it, for in place of the usual severely printed billhead, a hand printed lettering is used which is perfectly legible, but thoroughly in keeping with the high class of trade to which the store caters.

It is an establishment located on the edge of a residence district and has been remarkably successful in building up the "home" side of the business. The neat stationery is but one of the minor opportunities

Louis Levy Manager

Telephone Prospect 230

LEVY ELECTRIC CO.

1230 POLK ST.
SAN FRANCISCO

EXPERT ELECTRICAL SERVICE

The upper half of this bill is pleasing

for the making of a good impression which the wide-awake store does not miss.

Just in the same way as you judge the personality of your correspondent by the letter paper he uses and the general style of the letter, so the customer is inclined to judge the contractor or dealer by the appear-

ance of the billhead or estimate sheet. If this is carelessly prepared or illegible, unconsciously the record is chalked up against the writer's credit. This store not only fails to make a bad impression with its bills, but has actually succeeded in turning them to its advantage.

UTILIZING THE PUBLIC'S INTEREST aroused by another man's advertising is perfectly legitimate in some cases. The installation of an electric pump, shown here, is part of an exhibit of California farm lands which occupies the display window space of a San Francisco establishment. The device is self-contained, pouring the water out into a miniature irrigation ditch, through which it flows about the model farm patch and returns to be pumped over again. The arrangement is most attractive, an advertisement of the possibilities in oats and alfalfa being borne out by the little patch which is actually planted and sprouting a delicate carpet of green.

The fact that there is almost always a crowd about the window is a good demonstration of the



A miniature farm which attracts considerable attention

drawing power of moving things. There is a particular fascination about running water which always brings a group of onlookers.

The moral of the story is in the possibilities of mutual advertising. The lands here brought to the attention of the public would be quite without value except for the possibilities of irrigation, which in turn is dependent largely on electric pumping. The real estate company then regards the pump installation as a most desirable feature of their exhibit, while on the other hand it brings the pump to the attention of prospective buyers in a most favorable way. The idea might well be carried into other lines of electrical apparatus and appliances and advertising extended beyond the store itself into the diversified appeals of other industries.

A STORE LIGHTING CAMPAIGN was effectively carried out by P. B. Alexander of Texas, who tells of its success in a recent number of "How-I-Did-It."

Electrical education, like charity, begins at home. With this in mind, we offered a prize of \$15.00 to the school child under fifteen years of age who would submit the best essay of 250 or less words on the subject,

"Why Stores Should be Well Lighted." We advertised this and limited the contest to a certain date.

The writer took charge of the campaign and immediately went to the superintendent of schools and told him of the details of the plan. The scheme pleased him very much and he promised to call our advertisements to the attention of the teachers interested and assign this contest as a theme subject.

After the closing date the nearly two hundred essays were turned over to a chosen committee and the winner was picked. So many of the essays were of such merit, though, that aside from the first prize of \$15.00, we created ten extra prizes of one dollar each and gave these to the next ten children.

After the smoke had cleared away we got busy on our list of contestants and the city directory and we picked out those whom we recognized as children of store owners. We found a surprising number of these from which we worked up an excellent mailing list.

The little girl who won the first prize was the daughter of a man who kept a little "neighborhood" store, and in a short while he had replaced his old fly-specked drop cords and bare lamps with neat pendant fixtures and Mazda C lamps, one of which was left burning all night. (His little girl had stressed the burglar protection point in her essay, and I worked it in that way.)

Another contestant proved to be the son of a man who had the only gasoline lighted ladies' furnishing goods store in the city. Ye gods! How we laid it on to him! Sold him? Sure! We sold several others, too, the details of which I won't burden you with here as this is a "wholesale" idea, and we can't deal with specific instances at too great length.

Aside from the actual business we secured from this contest, we made many friends. We brought flocks of our future customers to our office, thereby giving them a chance to become acquainted with us long before they would be called upon to deal with us. The ice is broken and in any future activity that we may plan, we can count on the interest of, at least, the school children. That's a whole lot, too.

We made the business men believe what we were talking about because their own children and their friends' children looked up facts about lighting and found them to be the same as we had been propounding.

THE STORE WITH ATTRACTIVE WINDOWS, is the way one customer was heard to describe the Gas and Electric Appliance Company of San Francisco. Surely the present example shown in the accompanying picture is an instance of it. The window is a clever combination of irons, toasters and lamps, combined effectively so that there is no appearance of crowding and no thought but that the display is unified. Indeed, the great beauty of the exhibit is in the single impression which it makes.

The value of making a picture of your window is here fully appreciated—and it is interesting to note that the public is struck by the result and usually stops in passing this display and looks into the matter in detail. Aside from those customers bent on a deliberate purchase who would enter a store in any case, much of the trade which comes to an establishment comes because of some former impression which has been made on the customer's mind. In this respect a

show window is exactly like a billboard or other advertisement with the advantage of three dimensions. And exactly the same factors which go to make these



A window the passer-by remembers

other advertisements successful, mark the drawing qualities of such an exhibit. It is recognized that an artistic poster or a well designed newspaper ad, with distinctive type and composition, are objects to be desired—just so are beauty in color and line, the elements with which a window display is built. Note how women—and men, too—will group about a window remarkable for its beauty in other lines of merchandising than your own. They may not purchase what is in the window any more than you are stimulated by the ads in the street cars to at once buy yourself a certain brand of collars—but they remember the store just as you remember the collars or chewing gum, and they look it up at a later date when they happen to need its type of ware.

A MOVING NUMBER calls the attention of the passer-by to the store of A. E. Wells Company, of 78 Second street, San Francisco. This effective number in raised gold against a background of black is eccentrically mounted on a rotating shaft so that the entire disc describes a slow convolution, remaining, however, always in an upright position. The store is conveniently located on a busy street, where the passers-by have an excellent opportunity to have their attention attracted. The conception is a particularly good one,



It moves!

for the notice is called not only to the store, but the number itself is emphasized in the mind, so that it becomes a part of the odds and ends of information upon which the average person draws in governing their lives, from deciding on a moral question to determining where to go to have their house wired. And to have this person recollect "that store at 78 Second"—is surely an end to be desired.

THE ARCHITECT AND THE ELECTRICAL MAN

BY H. P. PITTS

(It is an acknowledged fact that upon the original wiring of a house and the provision for base outlets and the like, depends to a great extent the subsequent use of electrical appliances in that home. From the electrical man's standpoint, it is essential that the architect, who has so much to do with planning homes, should know what can and cannot be done along electrical lines—and the architect himself welcomes information which will be of value to his client. This suggestion of mutual helpfulness was made at a recent joint meeting of architects and electrical men at the San Francisco Electrical Development League. The author is of the industrial engineering staff of the Pacific Gas & Electric Company.—The Editor.)

The idea that we have, with reference to the relations between the architect and his client, is that the former is requested by the latter to produce satisfactory plans and specifications for a building—a home for instance. The next move is to put these into reality, seeing to it that every detail is lived up to by the contractor, and that the building is turned over to the owner in perfect detail—presto—it is expected that when the home is first occupied by the owner there shall be nothing lacking in comfort, view, surroundings and conveniences. This is the architect's business and is what he is spending time, patience and money upon, and, as these three items are the only real ones that are worth while saving these days (outside of food), it is essential that he look for assistance in every possible direction.

In the designing of a home, it must be a puzzle to determine which features shall be the most important, and whether or not one has to be sacrificed to accommodate another. The location of certain rooms with relation to one another may interfere with the electrical features, in that it may cause the meter and switchboard location to be placed at a point directly contrary to where it might be advisable to bring in the wires for lighting and power. Experience tells us that this one feature could be greatly improved upon, and that had the architect discussed this apparently simply matter with the contract manager of the central station, information would have been furnished which would have not only saved unnecessary expense, but would have made smooth sailing for the electrical contractor, whose business it is to live up to specifications. This is a very vital matter, and it should not be presumed from the mere fact that there is a pole standing in front of the premises that it is a central station pole; it might be a telephone pole, or again, might not be the pole from which the energy could be conveniently taken. A great deal of this trouble has been fought out between the central station and the electrical contractor, when all controversy might have been eliminated had the former's representative been called in when the specifications were being prepared. Particularly is this true with reference to underground services.

Within the house the matter of good illumination is of very vital importance, probably not so apparent

to those who stay at home all day, and who complement the architect on the arrangement of the rooms and other conditions to make the view most enchanting, as to the one who leaves the house in the morning before the view is apparent, and who arrives home after the view has faded. Mostly, what he sees of his beautiful home is what the lighting effects give it. His temperament should be studied and considered, and the central stations have provided means whereby the best information may be given as to good lighting.

Electric apparatus within the house: It has come to be generally agreed that baseboard sockets distributed about the house are as essential as that the house should be wired for lighting. The conveniences of labor saving electrical devices are today solving many a former serious household problem. The cost of household labor, together with the scarcity of it, is driving many people from good homes to the congested apartment houses. Were outlets properly placed in all modern homes, not only would their presence suggest the purchase and sale of labor saving electrical devices to a greater degree, but would encourage the housewife to attempt her work in

WHERE THE ELECTRICAL MAN COULD HELP THE ARCHITECT

Proper location of meters and switchboards
Convenience to central station poles.
Engineering elements of good lighting.
Provision for later use of appliances.

her own home. Carefully prepared statistics disclose the fact that in San Francisco in the past year, hundreds of homes have been abandoned for apartment houses, and a survey of these vacant houses discloses the fact that there was no provision for attaching plugs for electrical heating devices, vacuum cleaners, washing machines and food preparing appliances, etc. People simply could not get help, and rather than drudge, they took the next best means of existence, that of giving up their otherwise comfortable homes for the apartment houses. The lesson to be learned from the conditions are obvious, and need not be elaborated upon further.

Now then, a word to the central station representative. You are anxious to get in touch with the architect, you would like to be his friend because you can be of mutual benefit to each other. However, you must not think that you are at liberty to rush into his office at any time of the day and demand an audience, for he is a busy man, not busy in the sense that a restaurant man may be when lunch is being served, but, being an artist, his mind has to be concentrated on very artistic matters and must not be disturbed. It is necessary, however, that he have his business hours, and if you can make your subject interesting enough he will have a certain hour during the day that he will see you, particularly if you can convince him that he needs you, and it must be apparent to you that with all of the material that you have at your command, you can make yourself welcome.

Indeed, this closer spirit of co-operative helpfulness now so closely engendered among all branches of the electrical industry may well be extended to the architect and his labors. In this broadened sphere of helpfulness great good must be the inevitable outcome.

UTAH'S OLDEST ELECTRICAL CONTRACTOR

BY GOLDEN J. GUIVER

(A unique installation which involved the drilling of granite walls in some places seven feet thick in order to run the wires, was the achievement of the gentleman shown here two hundred feet above the ground. The fact that this construction was the work of the man who obtained the first contract for electrical work in the state of Utah is of particular interest. The author is a prominent contractor-dealer of Salt Lake City.—The Editor.)

This is a photo of the top of the northeast tower of the Salt Lake Temple, looking north; height of tower, 200 feet—showing the finial made entirely of copper, supporting eight 100 candlepower lamps. The person on the ball is E. G. Holding, who had charge of installing all the electric work in the Temple, which is built entirely of Utah granite, and was forty years in course of construction. The granite walls, whose thickness was from four to seven feet, had to be drilled to make way for the wires.



Two hundred feet above ground

Mr. Holding is the oldest electric contractor in the state of Utah. In January, 1881, he was the first one engaged by the Utah Telephone Company to put in an exchange in Salt Lake City. Work was started the first Monday in February of that year, and the exchange was started with seventy-five subscribers in the early part of April. (Salt Lake City exchange now has about 23,000 instruments in use.) The "central" consisted of a small room about 8 by 10, partitioned off the Western Union Telegraph office, and the equipment consisted of two 50 wire Gilliland switchboards.

During the spring of 1881, he was loaned by the telephone company to the Salt Lake City Light & Heating Company, for the purpose of putting in the first circuits for the first lighting plant in Utah, which consisted of four Brush arc machines of 40 light each.

In the spring of 1887, he branched out for himself and opened the first electric shop between Denver and San Francisco, and has conducted an electrical contracting business ever since.

The population of Salt Lake City in 1870 was about 20,000; today it is estimated at over 140,000.

This city enjoys the distinction of being the largest consumer of electricity in the world, according to population, there being 99% connected with the services of the Utah Power & Light Company.

WORDING A TELEGRAM

The importance of wording your order so that it may be easily understood, no matter where the telegraph operator places the period, is often underestimated. The result of such failure is interestingly told

by W. H. Brommage in a recent number of the Pacific Telephone Magazine.

A telegraph operator at San Francisco telephoned the superintendent of supplies that she had a telegram and gave it just as it appears here:

"Need at once for estimate number fifteen sixty eight fifty two piece transposition brackets. Have applied all available this division none on hand—division please have expressed to ——— care of Western Electric Company use requisition ——— if needed advise."

This is how the stenographer interpreted the message, and after reading it back to the telegraph operator, received the O. K.:

"Need at once for estimate No. 1560—850 2 piece transposition brackets. Have applied all available this division. None on hand ——— division. Please have expressed to ——— care of Western Electric Company. Use requisition ——— if needed. Advise."

This interpretation seemed to be very clear except that the quantity of brackets seemed unusually large. However, as an express shipment was desired, everything pointed to a rush job that needed prompt action from all concerned. Commencing with the sending of the telegram until the matter was finally completed, this is what took place:

1. Telegram from originating division office "A" to superintendent of supplies;
2. Telegraph operator San Francisco transmitted the message by telephone to supply department;
3. Supply department telephoned Western Electric Company to ascertain stock conditions;
4. Western Electric Company telephoned supply department, none on hand—stock due next month;
5. Telegram from supply department to division office "B" asking if brackets could be supplied;
6. Telegram from division office "B" to supply department, advising none available.
7. Supply department telephoned to division office "C" to ascertain if any brackets available, what quantity, and where located;
8. Division office "C" telephoned to supply department that a quantity of material could be furnished from several points;
9. Supply department telephoned to division office "C" to arrange for shipment of 265 brackets from three exchanges;
10. Long distance telephone from division office "C" to district superintendent to arrange for shipment;
11. District superintendent telephoned district plant chief to arrange for shipment from various points;
12. Supply department telegraphed to division office "A"—"Your message today. We have arranged to ship by express a total of 265 2-piece transposition brackets from points ——— division. May be able to obtain some from ——— division. If not will have them made locally and advise you by wire Monday";
13. Telegram from division office "A" to supply department—"Your message shows 265 transposition brackets. All we want is 50 and our telegram must have been incorrectly transmitted."
14. Supply department telephoned division office "C" to countermand previous instructions and ship only 50 brackets from one exchange;
15. Long distance telephone from division office "C" to district superintendent to cancel previous instructions and only ship 50 brackets;
16. District office telephoned district plant chief accordingly.

Arrangements had been made to ship 265 2-piece transposition brackets from three points by express

instead of a total of 50 brackets which were required, and this would not have been necessary had the original telegram been properly worded so that the figures representing one item were separated by a word from figures referring to another item. If the telegram from the Division Office "A" under paragraph 13 had not been dispatched promptly the instructions given under paragraph 9 would have been followed and a quantity of brackets in excess of the requirements would have gone forward by express thereby constituting an overstock at that particular point; the result being—

1. Necessity of finding some other job where they could be used, or

2. Necessity of notifying other divisions that these brackets were available at a certain point and arrange to order them on other requisitions;

3. The possibility of shipping them back to the points from which they were originally ordered;

4. Additional expense.

It can readily be seen that much labor, time and expense could have been avoided if a little forethought had been given to the composition of the original message and as to how it would be translated at the receiving point. The message would have been clearer had it been as follows:

"Need at once, fifty transposition brackets, two piece, estimate number fifteen sixty eight, etc."

ELECTRICAL INSPECTION

BY E. F. DUNLAP

(Portland has a record of very high class work in electrical installations—which may be said to be due largely to the effective inspection system. The details of this work in the field and in the office are here given by a man who is at the head of the inspection department. This interesting article covers the subject matter of a recent paper read before a Northwest convention of contractors and dealers.—The Editor.)

System is needed in the office as well as in the field. By some who are not in a position to judge, this is known as "red tape." The records of inspection must be complete. The filing system must be simple but accurate, so that a record or report of inspection of any installation may be found quickly and thus result in a saving of time, which is a very important factor. The work must be handled in such a manner that the maximum of results may be obtained with a minimum of time. A system must be used by which uncompleted work and also installations on which corrections are pending may be easily kept track of. In support of the system used in Portland, I will say that during the five years which have elapsed since the organization of the department nearly 35,000 permits have been issued, of which probably 400 are still in what is known as the live files. Many of these no doubt have been completed, but this office has not been notified for reinspection.

Another feature of our ordinance which has assisted us a great deal in securing a high standard of installation is the licensing of contractors and supervising electricians. Thus we are able to place the responsibility for defective work and secure its correction in the shortest possible space of time. Every permit except an owner's must be countersigned by some electrician who has had at least four years' experience. Thus we are enabled to obtain a better quality of work than any city which it has been our privi-

lege to investigate. A very high tribute was recently paid to the wiremen of the city of Portland when an inspector of the National Board of Fire Underwriters engaged in resurvey work visited Portland, and the writer had the pleasure of showing him some installations chosen at random, both conduit, knob and tube work. The inspector stated that it was the best work he had ever seen. The need of having all work done under the direction of experienced persons has become so apparent that many cities and even some states are requiring all electricians to pass an examination as to fitness and qualifications. An amendment to the ordinance of the city of Portland is pending which will require all persons hereafter applying for a license as supervising electrician to pass a satisfactory examination before a board of examiners composed wholly of electrical men. Electrical contracting is being looked upon more day after day as a profession, and there is no reason, therefore, why the persons engaged in the work should not be required to possess the necessary qualifications and be licensed.

With the routine of our work many of the contractors are familiar. For the benefit of those who may not be acquainted with our system, I will make a few explanations. In making application for a permit, the applicant is required to fill out a blank giving the address, by street and number, of the installation, the class of work to be done and the number of outlets, switches, motors or other work. This information is all written on a card suitable for filing, and given to the inspectors in each district, who file them by permit number until a call for inspection is received. As this card gives all the necessary information, he takes it with him to the job, and as the inspection is made, a complete record of the job is written thereon. If the work is ready for covering, a small white label is filled out giving the lathers or carpenters permission to cover. This is pasted in the cabinet box. Many of the lathers have found to their complete satisfaction that they are not allowed to cover until this permission has been given. When final inspection is made, a blue label approving the installation for service is filled out and also placed in the cabinet box. This is permission to the service companies to connect.

A method of facilitating service has recently been adopted whereby the service companies run their drops, install the meter and then seal the main line switch open with the seal of the company with a card attached, warning all persons against breaking the seal and giving service before the inspector has given his approval. Upon making final inspection the city inspector breaks the seal, gives service and returns the tag to the company which is notice to them that service has been given. Another advantage of this arrangement is that it gives current so that the inspector can test for continuity.

When a card for an installation is given final approval, it is filed away in the permanent file by street number, which has been checked for accuracy by the inspector at his first visit. Many incorrect addresses are given on the application. This frequently results in a loss of time of at least one day in making the inspection. The contractors are realizing this and we are pleased to state that the number of improper addresses is getting fewer as the necessity is realized.

Technical Hints

BY GEORGE A. SCHNEIDER

(Practical information which will help the contractor-dealer to meet the emergencies of his business and to better his trade is here given in these three articles by a man who is in constant touch with the actual problem. A suggestion for better installations in kitchens and bathrooms which will eliminate the possibility of accidents from faulty insulation is a matter which deserves particular attention as making for the greater confidence of the public in electrical appliances. The elements which should be considered in the selection of the type of speed regulator and the considerations which govern the substitution of bell ringing transformers for batteries with interior telephone systems are further analyzed.—The Editor.)

NOTES ON SPEED REGULATORS FOR DIRECT AND ALTERNATING CURRENT MOTORS—I

When selecting speed regulators for shunt or compound direct-current motors in which the speed changes are effected by inserting resistance in the armature circuit or for slip-ring type polyphase motors, it is necessary to carefully study the operating characteristics of the machine or apparatus to be driven by the motor, otherwise the regulators will not give the necessary range of speed control. These regulators may be of the machine duty or fan duty type, depending upon the service. The difference between the two types of regulators is in the carrying capacity and total resistance of the resistors which form a part of the regulators.

The constant torque resistor, formerly termed the machine duty resistor, is a resistor for use in the armature or rotor circuit of a motor where the current remains practically constant throughout the entire speed range. This means that the horsepower output of the motor decreases directly with the speed as in the case of a motor driving a plunger pump. In this case the torque and therefore the armature or rotor current will remain practically constant over the entire speed range. Here the work done by the motor at one-half speed is one-half that done at full speed.

Machine duty or constant torque controllers are usually designed to reduce the speed of the motor 50 per cent from normal with full load torque on the motor; that is, when the motor is fully loaded at normal speed.

A fan duty resistor is one for use in the armature or rotor circuit of a motor where the current is approximately proportional to the speed of the motor. For example, a fan driven at one-half its normal speed requires less than one-half as much torque as it would require running at its normal speed, and the work done by the motor will be less than one-quarter of that done at normal speed.

Fan duty resistors are generally designed with sufficient resistance to reduce the motor speed 50 per cent with the motor operated at one-half full load current.

The term machine duty does not necessarily mean that any motor for driving a machine should have a machine duty resistor when speed control is to be effected by resistance in the armature or rotor circuit. For example, fan type regulators will operate successfully with motors driving small job printing presses, ice cream freezers, centrifugal pumps, certain types of mangles and similar machines. Primarily,

however, these regulators are designed for use with motors driving ventilating fans or blowers with similar characteristics. The two types of regulating resistors are laid out very differently in ohmic value and current carrying capacity, and therefore cannot be used interchangeably.

In selecting regulating rheostats for shunt or compound motors to give both armature and field control, it is also necessary to ascertain the nature of the load and select the resistors for either machine or fan duty accordingly, in order that the proper amount of resistance of the correct carrying capacity will be supplied for the armature circuit. The amount of resistance and its capacity for the field current will be the same for either kind of service.

With shunt or compound motors it is customary to furnish the resistors suitable for continuous duty without excessive heating. However, in connection with slip-ring motors, in sizes about 5 horsepower and larger, it is the practice to select the resistors for starting duty, crane or hoist duty, or continuous or regulating duty. In the smaller sizes there is very little difference in the cost of the different resistors and it is customary to design them for continuous duty and use them for any purpose so long as the amount of resistance is correct. In any case the resistance must be selected either for machine or fan duty.

The difference in resistors for starting, crane or hoist and regulating duty is of course in the carrying capacity; the regulating resistors being designed for continuous service at full capacity.

It should be noted with motors controlled by machine duty regulators that if less than full load torque is developed, the speed reduction will be correspondingly less. In other words, the amount of speed reduction secured will depend upon the current and, therefore, the torque, and the amount of resistance in the circuit. This applies to both machine and fan duty regulators.

It is also well to remember that speed reduction obtained by armature or rotor resistance is a wasteful method; the efficiency of the motor falling off as the speed is reduced.

Careful observation of these points will help to eliminate many of the misunderstandings and delays in connection with orders or installations involving this sort of control apparatus and equipment.

BELL RINGING TRANSFORMERS FOR INTERIOR TELEPHONE SYSTEMS—II

In the article on interior telephone systems in the August 15th issue of the Journal of Electricity, it was pointed out that battery troubles are usually the most common in connection with these telephone systems or similar signal systems, not because the battery is necessarily the weakest part of the system, but because the battery is the part most likely to be affected by any defects in the wiring or instruments that would cause a short circuit or continual drain from the batteries. The number of cells of battery required for a telephone system is very small. When the correct number of cells is supplied and when properly installed in a cool, dry place, a set of batteries will last many months in ordinary service. On the contrary, when the batteries run down rapidly and the transmission is

quickly affected, it is almost a sure sign that there is either a wrong connection or short circuit that is causing the battery to run down, either due to a repeated heavy current discharge from time to time, or a continuous flow of current of small value such as would be experienced in connection with a high-resistance leak between wires or the equivalent.

In several cases of battery trouble on interior telephone systems which have been brought to the writer's attention, an attempt has been made to eliminate the troubles by replacing the batteries with a bell-ringing transformer. The results to be obtained by this change will depend entirely upon the cause of the trouble, the nature of the system and the circuit connections. Some interior telephone systems require only one set of batteries, while others require two

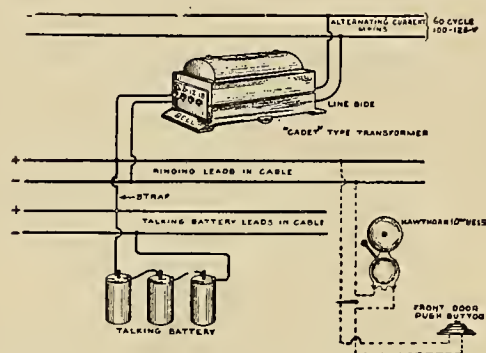


Fig. 1.—Connections showing use of bell-ringing transformer for ringing inter-phone bells and door-bells. Dotted lines show wiring for door-bell using same source of ringing current.

sets. Further, if a door opener is used as an accessory to the telephone system, usually a third set of batteries is needed for the opener. In the single battery system, the same battery furnishes both ringing and talking current and it is, of course, impossible to use bell-ringing transformers, because the talking circuits must be supplied with direct current. Where a separate ringing and talking battery is needed, it is possible in some systems to replace the ringing battery by a bell-ringing transformer. Before this is done, however, it is a good plan to consult the manufacturer of the telephone apparatus to determine if the particular equipment can be operated from a transformer without creating a disturbance in the system.

The connections for a bell-ringing transformer as used in one well-known interior telephone system, are shown in Fig. 1. Here it will be noticed, the system has a separate set of ringing and talking leads, so there is no danger of disturbance. This particular system gives selective talking and selective ringing. It is possible to hold as many conversations at one time as there are pairs of telephones; likewise, any one station may signal another without disturbing other stations.

In this diagram a circuit is shown for a separate bell or door opener. Whether or not either will operate on the transformer current will depend entirely on the design and size. Generally well designed direct current bells in sizes up to and including the four-inch size, will operate fairly well from a bell-ringing transformer, provided the transformer is of sufficient capacity.

Some door openers will not work on alternating current at all, but there are types that will give good

service. It is also sometimes possible to greatly improve the operation of some door openers by connecting the coils in parallel instead of series, as they are usually sent out from the factory.

When it is known beforehand that a bell-ringing transformer may be used with the system, it is better, of course, to select bells and openers especially made for alternating current circuits.

An article dealing with bells and bell-ringing transformers will be published in this department in the near future. It will include the very latest information on alternating current bells and method of determining the proper size transformer to supply them.

WIRING IMPROVEMENTS IN THE HOME—III

In several sections of the country more attention is now being given towards making better and safer electric installations in kitchens, bathrooms, pantries and similar rooms in the home. This is a matter which will warrant some study in almost every locality, because too often in these rooms very little effort is put forth to make the illumination most effective and the installation as safe as it might be made with but very little additional expense.

In such rooms, fixtures, switches or wall receptacles are frequently placed in such a position that it is possible for a person to reach them at the same time they are in contact with other house fixtures such as faucets, sinks, bathtubs or the like that are grounded. Here lies the danger in such installations. If the insulation becomes weakened or broken down, there is danger of a shock or burned fingers. Shocks received in this way on the ordinary 110-volt lighting circuit do not often cause a fatality, but are exceedingly unpleasant and likely to militate against the most general use of electrical appliances in the home. But it is not only in the home that these oversights in such installations are always found. They are also common in public places. The writer has been in at least a dozen large hotels where a bracket was located directly above and within reaching distance of the wash-bowl and faucets.

Perhaps the greatest menace is the brass shell key socket. This is a point of control, and as such is presumed to be perfectly safe to handle. However, one has no assurance that the shell is not connected with the ungrounded side of the circuit. The brass shell socket, while very excellent in its place, is not the best enclosing medium for sockets used in such installations as are here mentioned when of the key type. When used they should be of the pull-chain type, and each chain should be fitted with a suitable insulator, but it is better and safer to use porcelain sockets. Porcelain sockets should also always be used in basements or laundry rooms where the floor is likely to be damp. In some cities this is mandatory.

Further improvements can be made by more carefully arranging the fixtures and by a more general use of switches.

The electrical contractor-dealer is in a position to do much excellent work towards such improvements in these installations, and should always take every opportunity to point them out.

WHAT WESTERN INVENTORS ARE DOING

BY H. G. PROST AND WM. K. WHITE

(Suppose you discover that another man is manufacturing the article which you have patented—have you a right to stop him? What damages you can collect and how you must go about it are explained in the article of this issue. If you are accused of infringing someone else's patent, on the other hand—the conditions under which you may maintain your position are here pointed out. The authors are well-known patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Protection of Patent Rights

The manufacture, sale or use of a patented device, without the consent of the owner of the patent, constitutes an infringement of the patent. The United States courts have exclusive jurisdiction of all suits brought for the infringement of patents.

The United States is divided into nine circuits, in each of which there is a Circuit Court of Appeals. Each circuit is divided into a number of districts, in each of which there is a District Court.

An infringement suit must be brought in the District Court for the district in which the defendant resides, or any district in which the defendant has committed an act of infringement and has a regular and established place of business. In the latter case, service of process may be made upon the agent having charge of the defendant's business in such district.

From the decision of any District Court, the losing party may appeal to the Circuit Court of Appeals for the circuit in which the District Court is located. In patent cases the decision of a Circuit Court of Appeals is, with certain exceptions, final. In some exceptional cases, the controversy may be carried to the Supreme Court of the United States at Washington, D. C.

In suing for the infringement of his patent, the owner thereof may either bring an action at law or a suit in equity. In an action at law, which is tried before a jury, the patent owner can recover only the damages suffered by him by reason of the defendant's infringing acts. In a suit in equity, which is tried by a judge alone, the patent owner may recover either the damages suffered by himself or the profits made by the defendant by reason of the latter's infringing acts. In such an equity suit, the patent owner may also obtain an injunction restraining the defendant from making, selling or using the patented device.

Patent owners should give notice to the public that their articles are patented, either by fixing thereon the word "patented," together with the day and year the patent was granted, or when, from the character of the article, this cannot be done, by attaching to it, or to the package containing one or more of them, a label bearing a like notice. If the articles are not so marked, no damages can be recovered except for infringements committed after the actual notice of the patent has been given to the infringer. However, the failure to mark the articles with such a notice does not affect the patent owner's right to an injunction restraining further infringing acts.

It is an offense to mark an unpatented article "patented," and the law provides a penalty of not less than one hundred dollars for each offense, one-half of

the penalty to go to the person who shall sue for the same and the other half to the use of the United States. However, after the filing of an application for a patent on an article, it is proper to mark thereon the words "patent applied for."

The basis for computing damages in an infringement suit varies according to the facts. Where the patent owner has exercised his patent rights by granting licenses to others, the established royalty per article collected by him from his licensees may be used as the measure of his damages for the unlicensed manufacture or sale of his patented article. When there is no established rate of royalty, the measure of damages may be based on a showing that the patent owner would have made the sales if the infringer had not, and then computing the profits the patent owner would have made by making such sales. As his measure of damages, the patent owner may also show that, by reason of the infringing sales, he was compelled to reduce the prices charged for his own articles and, therefore, lost profits to the amount of such reduction. In some cases, the damages recoverable may be based on proof of what would be a reasonable royalty to charge for the making of the patented article.

As a general rule, an injunction in a patent infringement suit will not be granted until after the case is tried and a decision rendered in favor of the patent owner. However, after a patent is adjudged valid in some suit brought for the infringement thereof, it is then customary, in any subsequent suit against another infringer, for the court to grant a preliminary injunction before the trial of the case. The motion, for such a preliminary injunction, is heard upon affidavits setting forth the necessary facts.

Defenses

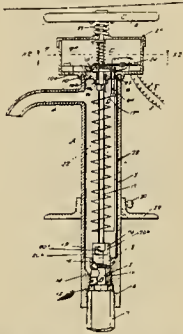
The defendant, in an infringement suit, may attack the validity of the patent, as well as deny the charge of infringement. Among the various defenses that may be relied on, the following are specially provided for by the United States statutes, to-wit: First, that for the purpose of deceiving the public, the description and specification filed by the patentee in the Patent Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or, Second, that the patentee had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or, Third, that the patented invention had been patented or described in some printed publication prior to the patentee's supposed invention thereof, or more than two years prior to his application for the patent in suit; or, Fourth, that the patentee was not the original inventor of the

invention covered by the patent in suit; or, Fifth, that the patented invention was in public use or on sale in the United States for more than two years before the filing of the application for the patent, or had been abandoned by the patentee to the public.

NEW IDEAS FROM THE WEST

Electric Water Heater

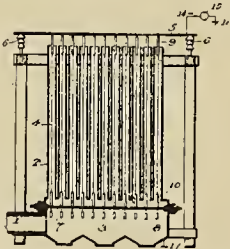
Patent No. 1,252,661, issued to Howard K. Clover of Los Angeles, California, and assigned to the Electrical Products Corporation of Wilmington, Delaware, discloses a novel form of electrical water heater. This heater comprises a vertical tube having an outlet spout at its upper end and an inlet at its lower end. The flow of water into the tube is controlled by a valve seated on the inlet opening and connected to a



stem extending through and projecting through the top of the casing, where it is provided with a handle. A heating element surrounds the valve stem and is connected to switch contacts arranged in a casing above the tube, the switch being arranged so that it is closed when the handle is turned to open the valve. The feature of the construction is the arrangement of the switch and heating coil around the valve stem, so that for the purpose of repair the valve and the heating coil are removable from the tube at the same time.

Apparatus for the Electrical Separation of Suspended Particles from Gases

Patent No. 1,252,183, issued to Walter A. Schmidt and George C. Roberts, of Los Angeles, California, and assigned to the International Precipitation Company of Los Angeles, shows an apparatus for electrically separating suspended particles from gases. The apparatus consists of a header provided with a gas inlet and having a plurality of vertically extending open-end pipes connected to the header, the pipes

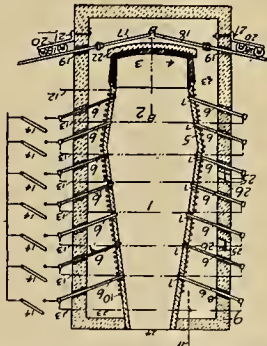


forming collecting electrodes. Extending axially through each pipe and insulated therefrom is a filament which forms the ionizing electrode. The ionizing electrode extends beyond the ends of the pipes and is provided with an enlargement adjacent each pipe end, so that its surface field intensity is reduced at those points. The gas is introduced into the header and passes upward through the pipes, wherein the suspended particles are separated from the gas and driven against the surfaces of the pipes.

Electric Ore Furnace

Patent No. 1,252,635, issued to John A. Ward of Spokane, Washington, discloses a novel form of electric ore furnace and a novel method of controlling the flow of current through the heating element. The furnace is heated by the flow of current through a heating coil surrounding the furnace and

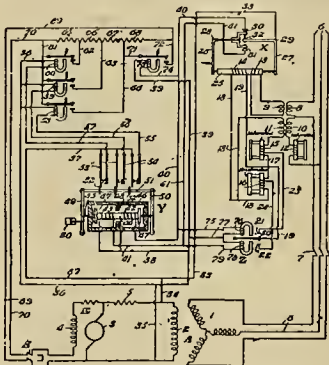
the current through the heating coil is controlled by a pair of adjustable arc forming electrodes in the circuit which are arranged exterior to the heater itself so that they have inde-



pendent heat radiating properties. A plurality of electrodes extend through the furnace wall into contact with the ore contained in the furnace for the purpose of producing arcs within the furnace, and a switch is arranged to divert the current from the heating coil to the electrodes, the switch being constructed so that it closes the circuit through the electrodes and the body of ore before it opens the circuit through the heating coil.

Voltage Regulator

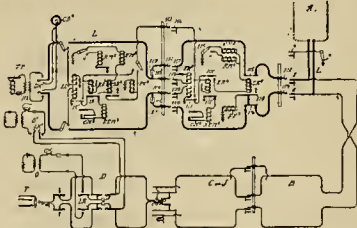
Patent No. 1,252,451, issued to Charles H. Kicklighter of Pasadena, California, and assigned to Westinghouse Electric and Manufacturing Company, discloses an improved form of voltage regulator for a dynamo-electric machine. The regulator consists of co-operating contact members, an actuating



winding therefor energized from the circuit of the machine, an impedance in circuit with said winding, and a relay mechanism controlled by the contact members for governing the field excitation of the dynamo-electric machine, and the value of the impedance in circuit with the actuated winding.

Telephone System

Patent No. 1,251,350, issued to Gerald Deakin of San Francisco, California, and assigned to the Kellogg Switchboard and Supply Company of Chicago, discloses a telephone system involving the use of link circuits and automatic switches. The system comprises telephone lines, operator



controlled link circuits and automatic switches for interchangeably connecting the lines and link circuits responsive to calls over the lines. The lines are provided with connection terminals and operator controlled automatic switches are provided for connecting to the terminals of a calling line and one of the link circuits while the receiver is removed at the calling sub-station.

SPARKS—Current Facts, Figures and Fancy

(Twenty-two thousand dollars a year from scrap metal rescued from the junk heap is not a bad record to emulate. Other examples of efficiency which might well be followed are those of the safety film which shows the workman what may happen and what he should do if it does, and the report of a new German power plant which is run on waste products alone. A report is further given of what is thought to be the highest telephone line in the world.—The Editor.)

The palm for "moderate millionaires" is to be given to America, which has the greatest number of fortunes from twenty-five millions down. In the higher ranks, however, the United States is surpassed by England, who has 79 payers of income tax on one hundred millions, whereas we have but nine.

* * *

Engineers of the Mountain States Telephone & Telegraph Company have installed what they believe to be the highest telephone service line in the world, with the possible exception of the Cerro de Pasco line in Peru. On the Denver-Leadville toll route the company has constructed the section of the line that crosses Argentine Pass at an altitude of 13,200 feet.

* * *

The new power house of the large railroad station that has just been completed in Frankfort on the Main, Germany, is the first large railroad power station in the world to be operated entirely on cinders taken from the locomotives. These cinders, according to the Frankfurter Zeitung, are piled in heaps from which an electric traveling crane runs directly to the boiler room.

* * *

Saving from the junk pile is clear gain. Odds and ends of metal thrown into the salvage bins of the Southern Pacific in 1917, brought a return to the company of \$22,000. Even the oil used to lubricate the machinery and the cuttings of the steel and iron castings is salvaged. It is reclaimed from the drip pans under every lathe and journal and bearing in the great shops. And now they are making ink out of the stub ends of indelible lead pencils.

* * *

The traffic congestion is not confined to the railroads—telegraph lines have been badly overcrowded for several months, according to the superintendent of telegraph of one the western railroads. War committee messages, freight tracing, and excessive trade messages have added greatly to the burden of the lines. If one word per message per day were eliminated, it would mean a saving of thousands of words—almost enough to relieve the overload.

* * *

Moving pictures showing typical accidents in the logging industry and how to prevent them are being shown by the Industrial Accident Commission of California at every logging camp and sawmill in the state. The idea is to show actual conditions and the scenario was written by one of the safety engineers to be taken in the woods and at the mills themselves with mill employees as "actors." The idea is a new one in

safety work and one which might well be applied to electrical industries.

* * *

A radiophone fog warning is being experimented with at the Point Judith light near Newport, R. I. The idea is based upon the fact that operators can judge to some extent the distance according to strength of signals with a known normal range. The apparatus will be in operation during fog, mist, rain and falling snow. The warning consists of the repeating of the words, "Point Judith Light," every five seconds, with limit range of about eight miles. After every third repetition the warning, "You are getting closer; keep off," is sent out with a limit range of about two miles.

* * *

A smokestack as high as a 25-story building is being built at the new addition to the Lacombe plant of the Denver Gas & Electric Light Company, and when it is completed and reaches 300 feet, it will tower above any structure in that city. Not only will it be an unusual height for a structure in Denver, but it will rank with the highest towers in the country. Its great height may be appreciated when one realizes that when complete, it will be taller than the famous Flat-iron Building in New York, which is only 286 feet high.

* * *

You are lucky if your telephone number is 8 in Japan. This number is particularly preferred because the character spreads downward and suggests the idea of gathering prosperity; 42 and 49 are unlucky, on the other hand, because the former may be pronounced "shini," which means "to die," and the later may be pronounced "shiku," which means "death" and "suffering." These numbers are, therefore, generally taken by government officials, schools, police stations and other institutions which are presumably immune from dangers such as might befall the individual should he fail to heed the demands of superstition.

* * *

Visible sound waves are among the latest reports from the battlefields. In a recent number of L'Astronomie, are published three letters from different places near the war front describing the appearance in the sky of rapidly moving, parallel arcs of light and shade, seen at times when violent cannonading was in progress. The description states that they moved with the speed of sound waves and their appearance coincided with the successive discharge of particular mortars. The space between the bands was greater for large than for small cannon. Apparently their visibility, which lasted altogether about ten minutes, depended upon particular relative positions of the observer, the cloud, the cannon and the sun.

PERSONALS

Dr. M. Shibusawa, electrical expert of the Special Investigation Bureau, Ministry of Communications, Tokio, Japan, is a recent San Francisco visitor. Dr. Shibusawa is no stranger to the Pacific Coast States and the states further to the East. He acted on the commission of awards for Japan at the St. Louis Exposition in 1904. He expects to make a thorough survey of electrical conditions in the United States and Canada before returning again to Japan six months hence.



Ralph A. Beebee, a civil engineer of San Francisco, has been named by Mayor Davie of Oakland to fill the newly created position of efficiency engineer under the department of public affairs. He will enter upon his duties the first of the month. His duty for the present will be to gather information desired by the mayor relative to the traction and power companies with a view to municipal ownership. Mr. Beebee is a graduate of Stanford University with the engineering class of 1907. He has been engaged as construction engineer for the Federal Telegraph Company since 1910. He was nominated as a candidate for the position by Professor C. D. Marx of Stanford, who was requested by Mayor Davie to submit a list of engineer graduates who would be eligible for the position.

Edward B. Thompson, oil engineer of Bombay, India, was a recent visitor in San Francisco.

Noble D. Powell, an electrical contractor of Stockton, spent the first of the month in San Francisco.

C. F. Barrett has resigned his position as superintendent of Water Supply and Water Works of Salt Lake City, Utah.

H. O. Duerr of Denver, Colo., has been appointed consulting efficiency engineer for the city of Albuquerque, N. M.

J. G. Girard of Miami, Arizona, has been named engineer in charge of the construction of a hydro-electric plant on the Colorado River.

Harlow Moore is now connected with the Board of Fire Underwriters in Portland, Oregon, having resigned as district manager for the Pacific Power & Light Company at Seaside, Oregon.

C. B. Hall, secretary of the Illinois Electric Company, and **Miles Steel**, Pacific Coast manager of the Benjamin Electric Manufacturing Company, are enjoying a brief vacation in Honolulu.

V. S. McKenny, of NePage-McKenny Company, electrical engineers and contractors, Armour building, Seattle, has returned from a business trip to Spokane, Butte and Lewistown, Montana.

Paul H. Manchester, formerly with the Pacific Gas & Electric Company at Martinez, has joined the 37th regiment of engineers—a regiment composed almost exclusively of central station men.

J. P. Baloun, chief of the drafting department of the Pacific Gas & Electric Company, San Francisco, Cal., has left the company to accept a position with the Pacific Coast Shipbuilding Company.

W. F. Doherty, formerly with the Peirson Engineering Corporation of New York, passed through San Francisco recently on his way to take a position with the Tata Electric Supply Company of Bombay, India.

J. R. Geary, for fifteen years Japanese representative of the General Electric Company, passed through San Francisco recently on his way to New York. He will remain in the United States for about five months.

G. A. De Haseth, formerly with the Tacoma Railway & Power Company, has been appointed manager of the Ponce (P. R.) Electric Company, succeeding P. M. Hatch, now in the ordnance department of the army.

Samuel Adams Chase, the genial assistant to the supply manager of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, is again a Pacific Coast visitor and is receiving a hearty welcome from his many well wishers.

Hans Mumm, Jr., has resigned as city engineer of Everett, Wash., to accept a position with the Portland Cement Association with headquarters in Spokane. Mr. Mumm formerly was assistant city engineer of Everett, and Snohomish county engineer.

T. W. Mann, formerly of Paul's Electric Store, Medford, Oregon, who enlisted in the aviation corps last summer, has advanced to master signal electrician in the 372d Aero squadron and is busy getting ready to fight upon the battlefields of France at an early date.

Eugene C. Clarke has joined the Tacoma Railway & Power Company, Tacoma, Wash., to direct the instruction of trainmen and to handle general efficiency work. He resigned as supervisor of instruction for the Brooklyn Rapid Transit Company, Brooklyn, N. Y.

H. B. Sewell, formerly general superintendent of Houston Electric Company at Houston, Texas, has been chosen manager of the Puget Sound Traction, Light & Power Company and the Pacific Northwest Traction Company at Bellingham, Wash., and has taken charge.

Lester S. Ready, who for several years has been assistant engineer in the gas and electric department of the Railroad Commission of California, has been promoted to electrical engineer of that department, succeeding F. Emerson Hoar, who is now in government service.

F. T. Mumma, electrical engineer in charge of the electric sub-stations of the Chicago, Milwaukee and St. Paul main line, has been appointed superintendent of the telegraph and telephone department on the Anchorage division, of the Alaska Railways, succeeding Herbert Gaytes, resigned.

A. W. Eshelby, formerly with the British Columbia Electric Railway Company, has entered the railway department of the Westinghouse Electric & Manufacturing Company at the Seattle office and will have charge of railway motor equipment and control work in the Seattle territory for the company.

H. A. Bostwick, formerly assistant to the first vice-president of the Pacific Gas and Electric Company, who, as

announced in the last issue of the Journal of Electricity, has been put in charge of the San Francisco district with the title of general agent, is receiving congratulations from all quarters over this recognition of his true worth to the electrical industry in the West. Mr. Bostwick has for years been a potent factor in utility work—both gas and electric. His long service as secretary of the Pacific Coast Gas Association has been especially effective. Mr.

Bostwick's quiet but pleasing personality, combined with an overpowering sense of loyalty to his superiors, has won for him a host of well-wishers and admirers in the West.



E. W. Rice, Jr., president of the American Institute of Electrical Engineers, who recently passed through San Francisco after receiving marked honors from the Japanese government, has just delivered two forceful addresses at the annual Midwinter Convention of the Institute in New York City. Touching upon the electrification of railways, Mr. Rice said:



"It may be said that the present is not a propitious time in which to deflect any of the country's money into railroad electrification. I think that in spite of the enormous advantages of which I have spoken, we would be inclined to agree with such a point of view if it were not for the recent unpleasant demonstration of the failure of our railroad transportation systems to meet the demands which have been placed upon them by the industries, aggravated, it is true, by the war conditions and also by the unkindness of the weather.

"After all, the question for the country to decide is whether we dare to limp along with the present conditions of restricted production, due to limited transportation, at a time when the world demands and expects from us the greatest possible increase in our efficiency and total production."

Eugene J. De Sabla, Jr., promoter of companies out of which grew the Pacific Gas & Electric Company, returned to San Francisco late this month, after an absence of two years, to testify in bankruptcy proceedings arising out of the failure of the Northern Electric interests.

M. H. Aylesworth has been appointed assistant to the vice-president of the Utah Light & Power Company, Salt Lake City, Utah. He is an attorney and goes to Salt Lake from Denver, where he was a member of the Colorado Public Utilities Commission. The appointment of Mr. Aylesworth to this position became effective February 1.

Tracy Bibbins, president of the Pacific States Electric Company, and W. M. Deming, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, left recently for a month's business visit in the East. Mr. Bibbins goes to Schenectady, while Mr. Deming is covering a number of manufacturing centers in his trip.

C. S. Walters, vice-president and general manager of the Walla Walla Valley Railway Company, was in Portland the latter part of last month. His principal mission was to discuss the question of joint rate arrangements with the Oregon-Washington Railroad & Navigation Company in connection with the possible construction of the Prospect Heights extension to serve the Langdon orchard.

Frank J. Silsbee, publisher of the Pacific Petroleum Record and well known as a statistical expert, has been asked by Mark L. Requa, in charge of the oil division of the fuel administration, to come to Washington to assist in co-ordinating petroleum statistics in the war work of the division. Silsbee accepted and will leave for Washington in a few days. For a number of years Silsbee was in charge of statistical and other work for the Independent Oil Producers' agency.

J. A. O'Donnell of Los Angeles has been appointed by Mark L. Requa, head of the oil division of the fuel administration, to take charge of oil production. For many years Mr. O'Donnell has figured prominently in the development of Western oil properties and through a very intimate knowledge of the oil fields he will seek at once to establish relationship between the government and the producers of oil that will help materially in winning the war by assuring ample production.

Fred Burnham of Glens Falls, N. Y., has been visiting in Alameda, Cal., before sailing for Afghanistan to take charge of a big electric light plant constructed by the General Electric Company for the Emir of Afghanistan. The plant is located near Tabool, in the heart of the country. Mr. Burnham leaves his wife and family in America, as Europeans are not allowed to take their families into the Afghan country at this time. From Calcutta he will proceed across India to the Afghan border, and then comes a three weeks' trip on horseback to Tabool.

George Fillmore Swain, professor of civil engineering in the Graduate School of Applied Science of Harvard University, who is to be lecturer on the Hitchcock Foundation for 1918 at the University of California, as announced on page 205, Journal of Electricity, February 15, 1918, is to be elaborately entertained at dinner by the engineers of San Francisco on March 20, 1918. President Wheeler of the state university will be asked to preside, while honored guests will be Max Thelen, president California Railroad Commission; David M. Folsom, Pacific Coast Fuel Administrator, and John McGregor, president of the Union Iron Works.

J. W. Lieb, president of the National Electric Light Association and chairman of the National Committee on Gas and Electric Service, of which John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company is a member, has been doing some excellent work in assisting the national government at Washington. The committee has been requested by the Quartermaster's Department to find in the public utility field, if possible, 200 or 250 competent auditors. It is extremely difficult to get information on this class of work, and the public utilities are probably in the same position as other industries in having very few such men available.

Dr. Henry Suzzallo, president of the University of Washington, and chairman of the State Council of Defense, has appointed a committee of nine to thoroughly investigate ways and means of preparing for the future of Seattle's transportation problems. This committee is made up of some of the most capable men in the city, who are: Hamilton Higday, manager of the port of Seattle; Judge Brown of the Great Northern Railroad; Harold Preston, attorney and member of the King County Council of Defense; R. H. Thompson, consulting engineer and member of the city council, chairman; E. C. Mundroff; A. L. Valentine, superintendent of public utilities, Seattle; J. J. McCullough, head of the unit management of the railroad terminals; Guy W. Richardson, superintendent of railway, Puget Sound Traction, Light & Power Company; and George W. Aldin, secretary of the Ames Shipbuilding & Dry Dock Company.

SKIP-STOP SCHEDULES FOR CAR LINES

The United States Fuel Administration has had under consideration for some time past the question of putting into effect "skip-stop" schedules on urban and interurban electric railways using coal as a motive source. The proposition before the Fuel Administration is substantially as follows:

The regular passenger stopping places for electric railways shall be spaced so as not to exceed eight per mile in urban districts and six per mile in suburban districts. On interurban lines the regular passenger stopping places shall not exceed four per mile. Where safety stops are necessary, they shall be combined, when practicable, with the passenger stops.

There are approximately 50,000,000 car stops made in the United States each day. The "skip-stop" schedule would eliminate one-third of these. The elimination of 6,000,000 stops a year, together with the regulation of car heating, will bring a fuel saving of not less than 1,500,000 tons of coal a year, which will meet the fuel needs of 300,000 average families.

EVENTS IN THE LIFE OF THOMAS A. EDISON

BY FRANK D. FAGAN

(Edison's birthday, which was celebrated during the past month, has come to be an event of considerable importance in the electrical world. He stands in the mind of the average citizen as the present day exponent of what America can do in the practical application of science. This brief history of his life, as it was presented before a recent meeting of the San Francisco Development League, should therefore be familiar to every electrical man.—The Editor.)

1847—

Born February 11th, at Milan, Ohio.

1857—

Started chemical laboratory in cellar of his home.

1859—

Became newsboy and "candy butcher" on trains of Grand Trunk Railway, running between Port Huron and Detroit.

1862—

Printed and published a newspaper, "The Weekly Herald," on the train. The first newspaper ever printed on a moving train.

1862—

Saved from death young son of J. U. Mackenzie, station

agent of Mount Clemens, Mich. In gratitude, the father taught Edison telegraphy.

1863—

Spent nearly five arduous years as a telegraph operator in various cities of the Central Western States, always studying and experimenting to improve the apparatus.

1868—

Entered office of Western Union in Boston as operator.

1868—

Made his first patent invention, electrical vote recorder. The application for patent was signed October 11, 1868.

1869—

Landed in New York City from Boston boat, poor and in debt. Shortly afterward, while looking for work, was in operating room of Gold & Stock Telegraph Company when apparatus broke down. No one but Edison could fix it, and he was given job as superintendent at \$300 a month.

1870—

Received his first money for inventions, the stock ticker, \$40,000. Opened manufacturing shop in Newark, where he made stock tickers, etc.

1871—

Assisted Sholes, the inventor of the typewriter, to make the first successful working model.

1872 to 1876—

Worked on and completed many inventions, including motograph, automatic telegraph systems, duplex, quadruplex, sextuplex and multiplex telegraph systems.

1876 to 1877—

Invented the carbon telephone transmitter, which made telephony a commercial art, and which was combined in 1914 with his later invention, the phonograph, to form the telescribe.

1877—

Invented the phonograph. Patent was issued by United States Patent Office within two months after application, without a single reference.

1879—

Invented incandescent electric lamp. The invention was perfected October 21, 1879, on which day the first lamp embodying the principles of the modern incandescent lamp was put in circuit and maintained its incandescence for over 40 hours.

1879—

Invented radical improvements in construction of dynamo-electric machines, making them suitable for generators for systems of distribution of current for light, heat and power.

1881—

Established first commercial incandescent lamp factory at Harrison, N. J.

1880 to 1882—

Invented and installed life-sized electric railway for freight and passengers at Menlo Park, N. J.

1882—

September 4, commenced operation of first commercial central station in New York City for distribution of electric current for light, power and heat.

1891—Invented the motion picture camera. By the invention of this mechanism, with the continuous tape-like film originated by Edison, it became possible to take and reproduce motion picture as we have them at this day.

1900 to 1910—

This period covers the work resulting in the invention of the Edison Alkaline Storage Battery, and its commercial introduction.

1914—

Edison, being the largest individual user in the United States of carbolic acid (for making phonograph records), found himself in danger of being compelled to close his factory by reason of the embargo placed on exportation by England and Germany, the sources of supply, carbolic acid being used in making explosives. Edison devised a plan for making carbolic acid synthetically, set gangs of men working 24 hours a day to build a plant, and on the 18th day was making the acid. Within four weeks plant could turn out a ton a day.

1914—

On the night of December 9th, Edison's great plant at West Orange, N. J., was the scene of a great conflagration. Early next morning gangs of men were at work clearing up the wreck. Hundreds more were added during the day and work was continued 24 hours a day. Within 36 hours after the fire Edison had given full orders for the complete rehabilitation of the plant.

1915—

Early in the year 1915 Edison found that he was in danger of being unable to obtain a continuous supply of benzol, from which he made his synthetic carbolic acid. He decided to erect his own benzol plants. He experimented and perfected it in his laboratory at Orange, N. J., and arranged with two coke oven plants to put in his benzol plants. The first was installed at the Cambria Steel Co.'s plant at Johnstown, Pa., which was installed and put into operation in 45 days. Four other plants have since been installed.

The same year Edison conceived the idea of helping the textile and rubber industries of America by making myrbane, aniline oil and aniline salt, which had previously been imported from Germany. With much effort and hard work, he installed a plant in 45 days, commencing deliveries in June, 1915. He is now manufacturing 4000 pounds a day.

1917—

Since the United States entered the war, Mr. Edison has been constantly co-operating with the United States Government in various experiments, making them at Orange, N. J., and elsewhere.



MEETING NOTICES FOR ELECTRICAL MEN

(The many informal committee meetings which are being held throughout the West looking to the successful outcome of the N. E. L. A. convention at Del Monte in April, are perhaps the most important of the two weeks' meetings. A coming convention in the Southwest, as well as local meetings of considerable interest are further featured below.—The Editor.)

The Southwestern Electrical and Gas Association

After full deliberation on the subject, the executive committee of the Association decided that it would be for the best interests of the members of the Association and the other public utilities of the Southwest that a convention be held in 1918. There is so much business of importance to the utilities of the state now about to come to a head that it was considered necessary that all the utilities of the state, without regard to their membership in the Association, be urged to meet and discuss these and to arrive at a definite conclusion as to some united action on them within the next few months.

The executive committee, therefore, has assigned the days of Monday and Tuesday, the 15th and 16th of April, for the holding of the convention at Galveston, Texas, the headquarters to be the Galvez Hotel.

In order to be consistent in the matter of economy, the executive committee has made this a two-day convention instead of a three-day convention, as hitherto, and it has also cut out all forms of general entertainment for those attending, it being the idea of the committee not only to so economize expense and time but also to make this a strictly business convention, every moment of the two days to be devoted to the exceedingly important business which will be brought before those attending.

San Francisco Section,

A. I. E. E.

"Technical Features of the Interconnection of Electric Power Systems of California," was the subject of the February 28th meeting of the San Francisco Section of the A. I. E. E. The field was covered by a series of speakers covering various phases of the subject.

P. M. Downing talked briefly on the general aspects of the subject. G. S. Jacobs covered chiefly part of the matter contained in the recent Railroad Commission Report, showing combined load curves, growth of load, oil situation, etc.

The effect of the interconnection on the Pacific Gas & Electric system was discussed by J. P. Jollyman, and J. E. Woodbridge, W. B. G. Butler and W. M. Shepard spoke in general on the question of what their companies can contribute to the general power pool.

H. A. Barre sent in a paper discussing some of the features of interconnection as carried on in Southern California.

The Synchronous Club

The Synchronous Club of Los Angeles held its February meeting at Walker Theater Building, Roosevelt Hall, on Thursday evening, February 21st, 1918, at 8:00 o'clock. Lecture No. 9 of the Synchronous Electrical Course, on the subject of Steam, Gas and Oil Engines, was presented by J. W. Andree of the Southern California Edison Company.

Notes of California Association of Electrical Contractors and Dealers

Fresno: A meeting of the Advisory Committee of the California Electrical Co-operative Campaign met at Fresno, February 28th, and outlined further work for carrying out the details of the campaign. Mr. A. L. Spring, field representative operating in Southern California, presented a detailed report of conditions as he found them in various sections of the territory during his preliminary survey of that field, made during recent months.

Monterey: The Monterey Bay Electrical Contractors and Dealers held a get-together meeting at Watsonville, Saturday evening, February 16th, with practically a full attendance of all members. Officers for the new term were elected as follows:

W. Cox, Santa Cruz, president.

J. Stanovich, Watsonville, vice-president.

J. A. Noggle, Monterey, secretary-treasurer.

Sacramento: The Sacramento electrical contractors report increasing interest in the closer study of business methods recently instituted in their meetings. President H. C. Reid of the California Association of Electrical Contractors and Dealers, and M. A. De Lew were recent visitors to that city.

Electric Metermen's Association

February, 1918, has seen the commencement of the second year of the Electric Metermen's Association, whose membership comprises meter department superintendents, heads and others whose duties consist of electric meter, instrument and laboratory testing.

Membership comprises upward of twenty-five men residing in California north of the Tehachapi, representing the more important power companies in the same territory.

Meetings are held approximately every 50 days, at which papers are read relating to methods used in meter testing, installations, etc.; also uses of current and potential transformers and other auxiliary apparatus. At the conclusion of the papers, discussions are entered into by all members present.

At some of the meetings a dinner is held previous to taking up regular business. Present officers are as follows: A. E. Coney, Great Western Power Company, secretary. C. V. Kuchel, Great Western Power Company, treasurer. J. E. Bridges, Westinghouse Electric & Manufacturing Company, chairman.

San Francisco Electrical Development League

The league meeting for Wednesday, February 13th, was devoted to the first definite announcement of plans for the great all-inclusive convention, at Del Monte, April 24th to 27th. These plans were set forth in detail by Robert Sibley, editor of the Journal of Electricity and general chairman for

BUILDERS OF THE WEST—XXIV



A. G. WISHON

Loyalty is a virtue that has been admired by men throughout all history. By means of it nations have risen to world prominence and decaying dynasties been overthrown. Perhaps the instilling of loyalty among the workers in utility life of the West has added more than any other factor in making hydro-electric activity of this section of such record-breaking and effective strength. To A. G. Wishon, general manager of the San Joaquin Light & Power Company, builder and executive in the San Joaquin Valley—the greatest combined acreage in the world served by electrical pumping—this issue of the Journal of Electricity is affectionately dedicated in appreciation of his great service to the West—the lesson taught from his method of instilling simple, man-to-man loyalty among his workers.

the forthcoming convention. W. L. McKinley of the Sierra & San Francisco Power Company, and chairman of the membership committee of the Pacific Coast Section, N. E. L. A., presided.

The league, with only three dissenting votes, adopted the new constitution as it appeared in the Journal of Electricity for February 1, 1918, with a few minor corrections. As a consequence the word "Jovian" will not in the future appear in the official name of this organization.

The following officers were then unanimously elected for the ensuing term:

President, R. E. Fisher, Pacific Gas & Electric Company.
First Vice-President, H. C. Reid, Pacific Fire Extinguisher Company.
Second Vice-President, H. P. Pitts, Pacific Gas & Electric Company.
Secretary-Treasurer, J. W. Redpath.
Executive Committee—Tom Bennett, Rex Electric Co.; W. S. Berry, Western Electric Company; E. O. Shreve, General Electric Company; Frank Rieber, Rieber Laboratories.

COMMITTEES

Public Policy—T. E. Bibbins, chairman; W. M. Deming, H. Bostwick, W. S. Berry, ex-officio.
Finance—C. F. Butte, chairman; L. H. Newbert, S. B. Anderson, H. C. Reid, ex-officio.
Visiting and Relief—E. M. Cutting, chairman; James Littlefield, M. A. De Lew, K. I. Dasey, J. K. Lippincott, E. O. Shreve, ex-officio.
Reception and Attendance—W. R. Dunbar, chairman; Tracy Simpson, E. E. Brown, J. M. Barry, Wallace Brown, W. C. Wurfel, Miles Steel, H. L. Hawkins, A. E. Rowe, S. B. Gregory, H. P. Pitts, ex-officio.
Entertainment—F. E. Boyd, chairman; J. F. Pollard, G. I. Kinney, Harry Noack, Rod Guyett, Garnett Young, Frank Rieber, ex-officio.
Membership—George H. Curtis, chairman; R. F. Behan, Murray Orrick, J. B. Black, Frank Thrall, W. B. Sawyer, Ed Whaly, A. Youngholm, J. W. Redpath, ex-officio.
Publicity—A. H. Halloran, chairman; Nathan Bowers.

At the meeting for February 20, 1918, President Fisher made forceful announcement of his plans for the coming term, which include the publication of a League Directory, setting forth the names, businesses, telephone numbers and addresses of all members.

Miss Clotilde Grunsky, associate editor of the Journal

of Electricity, gave a talk on the Bible and its electrical applications, bringing in many allusions to league members, which proved extremely entertaining.

Pacific Coast Section, N. E. L. A.

Activities of the Pacific Coast Section, N. E. L. A., are proceeding apace. The membership committee is holding weekly luncheon meetings in San Francisco under the able chairmanship of W. L. McKinley. The papers committee of the commercial section will hold a meeting at Fresno, Cal., during the coming week, while the papers committee of the engineering section is fast getting its papers into final shape for the forthcoming Del Monte convention, April 24-27, 1918.

The convention committee, under the leadership of Robert Sibley, editor of the Journal of Electricity, will hold a meeting in Los Angeles, in the office of E. R. Northmore, of the Los Angeles Gas & Electric Corporation, on Wednesday, March 13, 1918, at 10 o'clock. It is expected that the other Southern California members will be present—Messrs. A. B. West, H. H. Jones, W. L. Frost. President H. F. Jackson has stated that he will meet with the committee at that time, and at the meeting of the Los Angeles Jovian League on that day put before the Southern California men the big things that are in the planning for the convention.

San Francisco Section American Society of Mechanical Engineers

The San Francisco Section of the American Society of Mechanical Engineers has taken a decided step forward under the able leadership of B. F. Raber, associate professor of mechanical engineering at the University of California. Weekly luncheons will hereafter be held on Thursday of each week at the Engineers' Club in San Francisco, to which all members of the American Society of Mechanical Engineers are invited. The luncheon price is 65 cents, and the club headquarters is on the top floor of the Mechanics' Institute Building.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
February 16—Speaker, F. W. Hild. Subject, "American Electric Railways and the War."

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.

Secretary—Allen G. Jones, Rialto Bldg., San Francisco.

Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.
February 28—Subject, "Technical Features of the Interconnection of Electric Power Systems of California."

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
February 19—Speaker, C. Kirk Hillman. Subject, "Alternating Current Motors."

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
February 15—Fifth Anniversary Meeting. Subject, "Symposium on Distribution."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS**National Association of Electrical Contractors and Dealers**

President—Col. Robley Stearnes, New Orleans, La.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Directors—California: W. D. Kohlwey, San Francisco. Oregon: Samuel C. Jaggar, Portland.
Next Convention—Cleveland, July 17-20.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—Allen S. Halls, 517 Railway Exchange Bldg., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Hardley, Hardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.

Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.

Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS**Electrical Supply Jobbers Association**

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST**National Electric Light Association**

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next meeting—Del Monte, April 24-27, 1918.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—H. C. Morris.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m., at Jahnke's Tavern, 524 S. Spring Street.
February 23—Speaker, F. R. Feitshans. Subject, "Alaska."

San Francisco Electrical Development League

President—R. E. Fisher.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company.
Meetings—About every 50 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.
Next meeting—March 21st.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.
February meeting—February 7th. Speaker—L. D. Gilbert. Subject: "The Practical Side of Portland Cement Manufacture."

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—Orrin E. Stanley, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.

President—B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS**American Ass'n for the Advancement of Science—Pacific Division**

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
February 20—Speaker, Frank G. Hinckley. Subject, "Commercial Law in China."

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Personal Items

Calvin Armstrong of Arcata, Cal., has purchased the interest of Frank S. Anderson in the Arcata Electric Shop, and the new firm will hereafter be known as Brand & Armstrong.

R. W. Wise was elected secretary of the Petaluma and Santa Rosa Railway Company to succeed T. B. McMurray, following the annual meeting of the stockholders. No other changes in officers were made, and all retiring directors were re-elected. No other business of any consequence was considered at the meeting.

P. J. Diebold, for many years foreman of electric motor repairs with the Capitol Electric Company, and for the past two years associated with M. N. Farr in the Farr-Diebold Electric Company, has organized a new electric company, with headquarters at 132 West Second South.

P. E. Yates has undertaken the management of the Pacific Coast branch of the Delta Electric Company, which has been established at 686 Mission street, San Francisco. The factory is located in Marion, Indiana.

H. S. Tuttle of San Francisco has been awarded the contract for installing electric conductors and appurtenances on the Market street municipal railroad, between the east portal of the Twin Peaks Tunnel and Church street, and between Van Ness avenue and Geary street.

B. A. Wagner and L. Babcock have taken over the Electrical Agencies Company, Inc., with offices at San Francisco and Los Angeles. Mr. Wagner has just returned from Los Angeles, where he has been active in establishing the office there. The company also has an agency in Seattle.

Present and Future Power Loads

The Western States Gas & Electric Company has accepted contract with the Stockton Fire & Enamel Brick Company for 250 horsepower in motors, which is an additional installation for an enlarged factory. New business recently secured includes a 150 horsepower addition to the power load of the Holt Manufacturing Company.

The Coos Bay Shipbuilding Company at Marshfield, Oregon, will add 200 men to its payroll, practically doubling its force. Plans are under way for the establishment of a briquetting plant at Marshfield, to employ from 50 to 75 men to begin with.

Eight hundred and ten kilowatts of electric cooking and heating apparatus were added to the lines of the electric company in the Lodi, Cal., district, during 1917. The following appliances were placed in active service during the period: 83 electric ranges, 71 water heaters, 75 room heaters, 1 disc stove, and 231 other appliances.

Active construction has been begun by the California Sea Products Company on its first shore whaling station at Moss Landing, on Monterey Bay, and the plant is expected to be in operation in two or three months. Buildings and machinery together will represent an investment of about \$100,000, according to the company's estimate.

Changes and Beginnings

The Chicago Fuse Manufacturing Company, Chicago, Ill., manufacturer of the "Union" line of electrical protecting materials and conduit fittings, has secured the exclusive right to manufacture the Multi-refillable fuse, under patents owned and controlled by the Multi-Refillable Fuse Company, Chicago. The transaction also includes the good will and trademarks, as well as the merchandise and machinery required in the production of this fuse, which will hereafter be known as the "Union" renewable fuse.

The Riley-Harness Telephone Company at Sprangle, Wash., has been incorporated with \$250 capital stock by John Emhoff, W. P. Tolle and W. E. Blevins.

The spruce cut-up plant of the United States Signal Corps at Vancouver, Washington, has been put into commission. This contains over 100 Allis Chalmers Manufacturing Company motors, also a large quantity of sawmill machinery furnished by this company, all of which was delivered, installed and placed in operation within 58 days.

The Wenatchee Valley Gas & Electric Company, of Wenatchee, Wash., has decided to install an additional power plant at Chelan Falls of 1,000 horsepower, according to G. D. Brown, president.

Timely Interest by Federal Authorities in Hydro-electric Development

In view of the active part the Journal of Electricity has been playing editorially in urging upon the government the necessity of unlocking its vast store houses of hydro-electric energy, the following dispatch from Washington is of unusual interest:

With the approval of President Wilson the federal railroad administration is about to interest itself in street railway, light, heat and power companies throughout the country whose financial stability may be threatened by mounting costs of operation. Where it appears necessary, increases in fares or rates may be suggested.

Correspondence between Secretary McAdoo, as Director-General of Railroads, and the President, made public recently, discloses that a committee representing public utility interests recently presented memoranda to the secretary, setting forth a most serious situation and asking that it be brought to the attention of the President. McAdoo and the President agreed that public utilities are a necessary part of the nation's equipment for war, and the secretary was authorized to communicate with local authorities in behalf of utilities found to need assistance.

Aeroplane Factory at Portland

The Beaver Electric Company of Portland, Oregon, is the firm that installed the electrical equipment in the O. K. Jeffery aeroplane factory, described at some length in the Journal of Electricity for February 15, 1918. This installation is now complete in every detail. All machines are driven by individual motors. This enterprising firm of electrical contractors is now adding another hundred horsepower on account of the rapid growth of the factory in having to turn out war orders on aeroplane parts.

Light and Power Plant Active

The city of Seattle lighting department has secured contract for the power to be used in the shipyards of the Erickson Engineering Company, now under construction, which will have five ways for steel ships and use 2500 horsepower. The unit of the city's auxiliary steam plant on Lake Union, now under construction, will probably be completed in March and will have a capacity of 12,500 kilowatts. The first unit has a 10,000 kilowatt capacity, which with the 10,000 kilowatts produced at Cedar Falls, aggregates a capacity of 32,500 kilowatts or 40,000 horsepower. The industrial growth of the city is such that the proposed plant on the Skagit River in the forest reserve will have heavy demands made upon it as soon as it is ready.

Washington Water Power Company's Financial Statement

At the annual meeting of the Washington Water Power Company, held at Spokane on February 4th, the annual financial statement of the company was presented, giving operating statistics for the past year. The number of customers increased from 32,067 in 1916 to 34,146 in 1917. During the year \$397,443 was expended for distribution system and equipment in the light and power department, and \$26,565 for buildings,

fixtures and grounds. The street railway system spent \$32,407 for road and structures. There was an increase of about 1,700,000 in passengers carried on the street railway in 1917, compared with 1916. This did not, however, increase the earnings, due to increase in wages. A heavy increase was recorded for the Coeur d'Alenes in Idaho, on account of mining activity in that section, the chief feature of this being the smelter of the Bunker Hill & Sullivan Mining and Concentrating Company, which began operations last July at Kellogg. In other lines mentioned it was shown that 945 electric ranges were sold and installed, also 390 electric water heaters for domestic use. Net earnings for the year aggregated \$636,041.02. Total assets are \$28,233,656.35.

Increased Cost of Materials

At a hearing to ascertain the valuation of Washington Water Power Company, at a joint hearing of the Washington and Idaho Public Service Commissions, the testimony of engineers was to the effect that the reproduction of the \$18,000,000 light and power plant system of the company would cost 50 per cent more at the present time than when it was constructed.

New Bond Issue

The Sierra and San Francisco Power Company has filed with the Railroad Commission its eleventh supplemental application in the matters of its request for authority from the commission to issue \$1,000,000 first mortgage bonds, and to reimburse its treasury for capital expenditures, requesting the commission now for permission to reimburse its treasury \$34,463.05 for capital expenditures during August, September, October and November, 1917. The company has out of the \$1,000,000 issue already paid for expenditures and reimbursed its treasury \$815,531.95.

Northern California Power Company Earnings

Northern California Power Company Consolidated closed the year 1917 with 10,044 consumers on its books, 378 new services having been added during the year. Gross operating revenues for the year amounted to \$965,915, of which sum all but \$80,000 was received from sales of electric power. This is an increase in gross over 1916 of \$119,688. In addition to revenues from sales of electricity, gas and water, the company received \$17,746 as profit on merchandise sales and other income, making a grand total income of \$983,661, as compared with \$857,448 in 1916.

Railroad Commission Decisions

The Railroad Commission recently denied the application of the Yolo Water and Power Company for a rehearing. The petitioner asserted that its contract with the State Farm at Davis had not been considered by the Commission. In dismissing the petition the Railroad Commission says it still holds that an order of the Commission relative to rates and service must be obeyed, as against the provisions of contracts entered into before the effective date of the public utilities act.

The Southwestern Home Telephone Company recently was authorized by the Railroad Commission to issue \$89,050 6 per cent two-year notes, secured by the pledge of \$177,500 first mortgage 5 per cent bonds. The company is also permitted to issue \$80,625 of trustees certificates.

Wider Range of Bids Wanted for Seattle Site

Amendment of the ordinance authorizing the issuance of \$5,000,000 of utility bonds for a completed hydro-electrical plant, and the amendment of the plans and specifications calling for bids for a completed plant within the federal reserve, may be made by the city council in order that bids may be received for projects not wholly within the federal reserve. Plans and specifications adopted by the board of public works, on which bids have been invited for opening on March 1, would limit the bidding to the Skagit river.

Fuel Oil Licenses

Latest reports indicate that the Presidential proclamation requiring licenses from oil companies applies only to companies manufacturing fuel oil in the form of residuum and gas oil, in amount in excess of 100,000 barrels per annum. It is not necessary for any producer to have a license to sell crude oil used as fuel oil. The preferential list of consumers provided in the order applies only east of the Rocky Mountains.

Company Will Pay on Condition

The Puget Sound Traction Light & Power Company proposes to the city of Seattle that it will pay \$72,443.50, which represents two per cent of its gross street car earnings for 1917, under the same condition that the payment of \$64,387.78 for 1916 was tendered a year ago. After the traction company had petitioned the public service commission in 1916 to be relieved of certain of its franchise obligations, including the payment of two per cent of its gross earnings to the city, the paving of rights of way and any portion of bridges, a conference with the mayor brought about an agreement that planking should be done in lieu of paving and that in the event the relief sought for was granted by the public service commission, that the amount of gross earnings tax for that year should be refunded. On January 3, 1917, the company tendered payment of \$64,387.78 with the stipulation that suit started by the city to force compliance with the paving provision be dismissed or withdrawn until final adjudication of the petition for relief. This payment was for 1916 earnings. Payment was refused by council and the amount returned to the company, the city then bringing suit to recover the amount. Payment of 1917 gross earnings tax is now tendered under exactly the same conditions.

Will Contest Fare Raise

Seattle will resist the effort of the Puget Sound Traction Light & Power Company to obtain an order from the Public Service Commission allowing a greater fare than five cents within the city limits. Corporation counsel has been instructed to prepare such ordinance as he deems necessary to resist any order that would relegate the state and city laws, limiting street car fares within the city limits to five cents. Public service commission recently stated that if a petition should be presented to raise the fare in Seattle from five to six cents, it would be given a hearing.

Tacoma Municipal Railway Makes Money

During the period from November 12 to December 31, 1917, the gross earnings of the Tacoma, Washington municipal electric line were such as to show a gain over the expense of operation. The line was operated for the city by the Tacoma Railway & Power Company. The gross earnings for the period were \$3573.84, expense of operation \$7233.66, net income \$2340.18.

Proposed Steel Rolling Mill

The United Steel Company has been organized for the purpose of building a steel rolling mill at Everett, Washington. The temporary officers of the concern are W. E. Stilling, 405 White Building, Seattle, chairman of the board of trustees, and J. Johnson, secretary. The technical and structural work of the plant will be under the direction of the secretary, who has had fifteen years' experience in the iron and steel plants of British Columbia. He is the prime mover in the proposition and began work on the plant eight months ago. All the details for the machinery have been completed and the first unit will be housed in a 60 x 200 foot building. This unit will comprise a 12-inch mill with two reheating and one electric furnace with a capacity of 60 to 100 tons a day. Negotiations are practically completed for the site and it is proposed to begin building work in about two weeks' time and to have the mill started in about four months.

Municipal Line Loses Money

During 1917 the municipal street car system of Seattle was conducted at a net loss of \$34,958.39, according to the annual report of Superintendent of Public Utilities A. L. Valentine.

Square D Company Holds Annual Sales Convention

The First Annual Sales Convention of the Square D Company, Detroit, Mich., was held at the Hotel Statler in that city on January 10, 11 and 12, and was attended by all of their sales representatives from coast to coast, several advertising men prominent in their field, and members of the company's advertising and sales departments.

Bryson D. Horton, president of the company, gave the opening address, which was followed by a talk on "The Industrial Plant," by A. MacLachlan, sales manager. L. D. Calhoun, advertising manager, spoke on "Industrial Advertising."

SERVICE DEPARTMENT

The following is a partial list of the applicants on our books. Employers interested in any of those listed will please use the file number in communicating with the Service Department, Journal of Electricity.

A 1—Local Superintendent—Power Company.—Age 33. Married—one child. General experience care and maintenance of lines; last 5 years local superintendent power company. Wants \$175.

B 2—Electrical or Mechanical Engineer.—Age 29. Married. University graduate. Four years superintending foreman and estimator. Wants \$150.

J 1.—Salesman or in Purchasing Department.—Age 31. Married. Two years college. Two years manufacturing company; five years central station work in commercial departments. Would not consider sales work with power company. Wants \$150.

J 2—Traveling Salesman or Advertising Department.—Age 21. Unmarried. Two and a half years advertising and traveling experience—electric piano, electric sign, etc. Desires work in California or Oregon. Wants \$100.

J 3—Superintendent Meter Work (or electrical estimating and construction). — Age 25. Married—1 child. Four years experience in various testing and construction departments power companies. Wants \$125.

L 1—Electrical Locomotive Engineer or Superintendent Light and Water Works.—Age 33. Married, 2 children. Six years stream traction engines; four years chief engineer and electrician industrial works; six years town superintendent water and light, two years city superintendent water and light. Desires position in warm climate for child.

M 1—Electrical Engineer.—Age 26. Unmarried. University graduate. Five years engineer distribution department power company. Wants \$150.

P 2—Salesman.—Age 23. Married. College training. Two years experience as salesman. Wants \$100.

R 1—Winder or Repair Man.—Age 27. Unmarried. Scotch. Five years apprenticeship; one year railway company; six years winding and construction. Wants \$100.

T 1—Superintendent of Operation or Construction (electrical or mechanical engineer).—Age 42. Married—3 children. Twenty years varied experience; foreman diamond drills, South Africa; electrician sergeant U. S. Army; chief engineer power company; foreman of construction, mining company; chief engineer power equipment mining company, etc. Wants \$250-\$300.

W 1—Chief Engineer or Assistant to Manager.—Age 37. Married—1 child. University graduate. Engineering apprenticeship course. One year salesman electrical machinery; one and one-half years assistant electrical inspector; 8 years electrical inspector and electrical engineer. Wants \$250.

Women's Department

G 1—Secretary—Young woman. University graduate—expert stenographer and typist. One year business experience. Wants \$90.

WAR SERVICE THROUGH WAR SAVING

BY JOHN S. DRUM

The fate of this nation may depend upon the ability of



W.S.S.
WAR SAVINGS STAMPS
ISSUED BY THE
UNITED STATES
GOVERNMENT

the people to grasp the vital facts of the War Savings plan, and their willingness to put this plan into effect.

We often hear that money will win the war, but it must be remembered that money is a symbol only — a symbol of purchasing power

which stands for the possessor's command over labor and materials.

When Congress appropriates twenty billions of dollars for war purposes, it means that the government is to be placed in control of labor and materials measured by that amount, which the people must pay for.

If there were an inexhaustible supply of the kind of materials and type of labor which the government is calling into use in the production of the necessities of war, we could pay for them through the creation of great credits and continue to live as we did in the past. But when we know that the supply is limited and that no amount of money can increase it, we realize that unless the people reduce their normal demands upon the productive agencies of the nation through saving instead of spending, we are trying to lift ourselves by our boot-straps.

Recognition of this fact gave rise to the War-Savings plan.

Great success has attended the two big Liberty Loan campaigns. Vast credits were raised to meet the immediate needs of the government. But while a few of the people—less than 10 per cent—subscribed liberally in the aggregate, the bulk of the loans was taken up by the big financial, commercial and industrial interests of the country. Most individuals who bought Liberty Bonds bought them out of their surplus, or with borrowed money. Very few gave up anything, made any real sacrifice or reduced their expenditures. Thousands of subscribers parted with their bonds almost as soon as they came into possession; and finally, 90 per cent of the people made no investment at all.

Subscriptions to government securities in war-time must come from thrift wealth to the greatest possible extent, and must be accompanied by an actual reduction in the individual's demands upon the productive resources of the country.

The War-Savings plan is designed not to teach thrift and saving, but to teach the meaning of thrift and saving in war time. It provides a special inducement to every one, but particularly to the 90 per cent of the population who have made no investment in Liberty Bonds, to practice sensible economies in their daily living and lend the money they save to the government in return for a guaranteed non-shrinkable security bearing 4 per cent compound interest. War-Savings Certificates are within the reach of every man, woman and child. The plan contemplates a series of day-to-day investments from day-to-day savings throughout the whole year, amounting in the aggregate to two billion dollars, or twenty dollars for every man, woman and child, or a total of \$2,000,000,000.

I have not touched upon the vital importance to the nation of every individual practicing self-denial as a conscientious duty, and the tremendous value of the kind of patriotism engendered thereby. Equally with the money and the things that money stands for, the government needs a will-to-win on the part of the people, who have it in their hands to spend wastefully and impede the war machine or perform true war service through war-saving.

LATEST IN EVERYTHING ELECTRICAL

(If the feet are kept warm, it is possible to stand any temperature. A foot warmer designed for use out of doors for those who must stand great exposure is here described. A starting switch which protects the motor against overload and under-voltage, a new line of choke coils and snap switches, as well as a meter for measuring coke oven gas and an automatic controller for flashing signals follow.—The Editor.)

Hubbell Toggle Snap Switches

The Hubbell Toggle Surface Switch differs from the ordinary snap surface switch in that manipulation is by the throw of a lever or toggle, instead of by the turning of a key or button. Throwing the lever up makes the circuit; throwing it down breaks the circuit. The movement is positive—the make and break quick and snappy.

The advantages of the toggle movement in a surface switch are three-fold—first, it permits making the switch more attractive and stronger than the ordinary switch; second, manipulation is much more convenient by means of the



Exterior of toggle switch with view of the interior of the single pole and three-way type

lever than by the turning of a key; third, the switch is self-indicating, the position of the lever showing at a glance whether the current is "on" or "off" without any marker or dial.

Electrically, the Hubbell Toggle Surface Switch conforms with the most rigid requirements of current practice. Mechanically, it is amply strong to resist the most severe duty—special care having been given to selection of materials and proportioning of parts to assure the utmost dependability.

It combines in unusual degree the best mechanical and electrical features, with an appearance which makes quick appeal to those seeking the dignity of simplicity and richness.

Foot-Warmer for Outdoor Service

To minimize the discomfort of long standing outdoors in severe weather, an electrically heated foot-warmer has just been placed upon the market by the Westinghouse Electric &



Top view of foot warmer

Manufacturing Company of East Pittsburgh, Pa. While designed primarily for lookouts stationed in the how and crow's nest of vessels, the device is applicable to the use of watchmen, sentries, doormen, traffic policemen and others whose work requires them to be out of doors continuously with

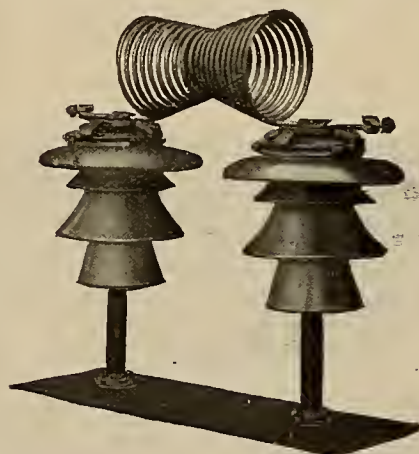
little chance for exercise. It has been found that if the rest of the body is adequately clothed, a foot-warmer will ensure comfort at any temperature. As will be seen from the illustration, the device consists of a casting 14 inches by 20 inches by 25 inches with diamond-tread top. This is of castiron, or of aluminum where non-magnetic qualities are desired, as in ship service. Against the under surface of this the heated element is clamped. The heater is a slotted ribbon clamped between two plates of built-up mica, so arranged as to give uniform distribution of heat.

A sheet-metal plate fastened by screws and sealed with high-melting gum renders the entire unit waterproof. The resistance is divided into two parts, which may be connected to draw 200, 100 or 50 watts at 125 volts. A three-conductor cable seven feet long is provided. By using the lower heats in mild weather, there is no danger of causing chilblains.

It is felt that this heater will add greatly to the comfort and hence to the efficiency of men in exposed places, enabling them to do their highly important work of watching and guarding without the distraction of physical discomfort.

Choke Coils for Alternating Current

A new line of choke coils for alternating current circuits has recently been put on the market by the General Electric Company. Choke coils should be considered as auxiliaries to lightning arresters. The function of a choke coil is two-fold: (a) To hold back the lightning disturbance until the lightning arrester has time to discharge it to earth. (b) To lower the



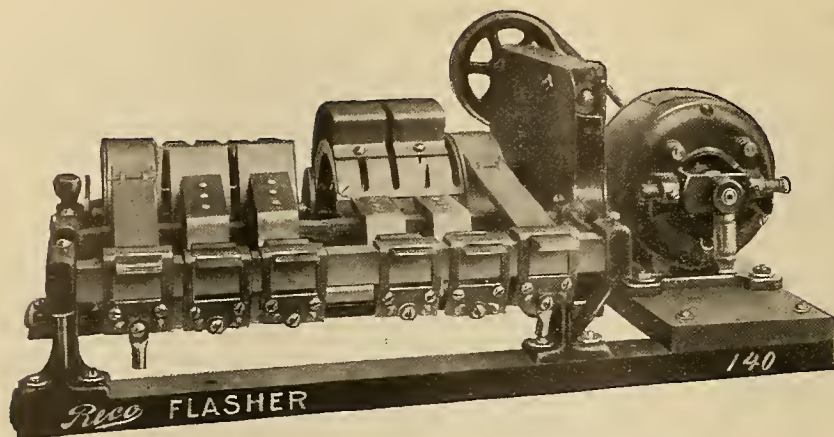
37,000 to 73,000 volts inclusive—outdoor service

frequency of whatever part of the disturbance goes through the coil so that it will be less dangerous to the connected apparatus.

The air insulation between turns of the G-E coil is an extremely important feature in the designs, as high frequency disturbances are likely to take the path across any supporting or separating pieces, thus nullifying the action of the coil. The air insulation has the advantage that should any arcing between turns occur, because of extremely heavy disturbances, the turns will re-insulate themselves. The copper coil also presents a very good appearance, conforming to the general appearance of strength and stability, characteristic of the modern power plant.

Measuring Coke Oven Gas

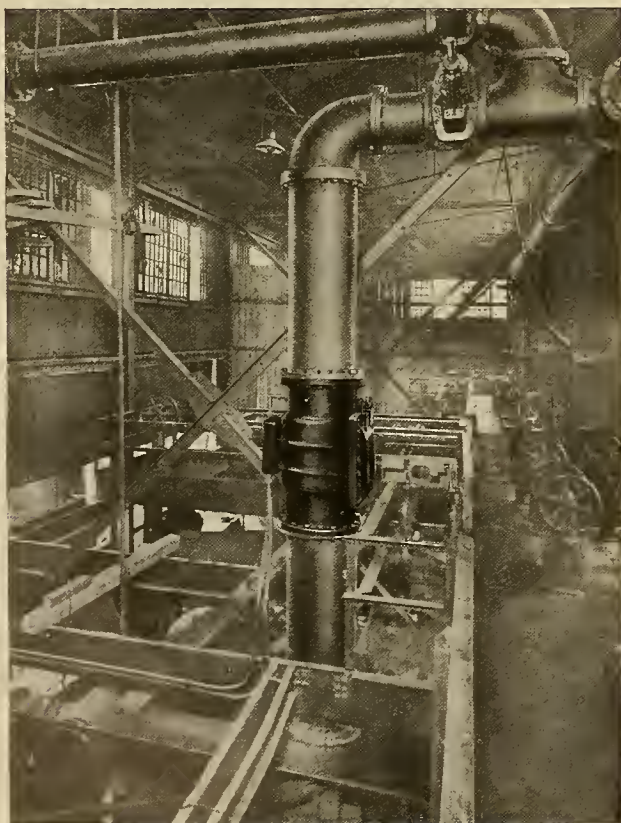
Increasing quantities of surplus gas from by-product coke oven plants are being consumed in various processes in steel mills, and it is desirable to have an accurate and reliable measurement of this gas. For this purpose, the Thomas meter has been applied, which measures the quantity of gas in standard units such as cubic feet at 30-60, without any calculations or corrections for pressure and temperature, although these may vary through wide ranges. The total quantities (in cubic feet) are shown on an integrating meter and



Automatic controller for flashing signals

the rate of flow is shown graphically on a curve drawing instrument. The graphic chart obtained from this instrument is very useful to the superintendent of a coke oven plant, showing him at a glance the amount of gas being used for fuel in the coke ovens over any period with variations in quantities clearly indicated.

The meter is installed in a housing which replaces a portion of the gas pipe line. The principle of the Thomas meter is that it measures the heat capacity of a gas electrically. The amount of electric heat necessary to raise a standard unit two degrees is used as a measure of the gas flowing through the meter. The electricity for heating the gas can be conducted on comparatively small wires, consequently the meters showing the amount of gas used can be placed in



The Thomas Meter housing is located at a convenient point in the gas line

the superintendent's office or other desired location, which may be several hundred feet from the meter. The chart shows him at a glance just how much gas is being used at any time in the steel mill. The complete Thomas meter and recording panels are made and installed by The Cutler-Hammer Manufacturing Co., of Milwaukee, Wis.

Automatic Controller or Rotary Switch

There are many places where an automatic controller may be applied. The accompanying cut shows a special controller constructed by the Reynolds Electric Company of Chicago and New York for a fire alarm siren made by the Federal Sign System (Electric) of Chicago.

By an ingenious arrangement of contacts, the sounds from the siren are graduated in tones ranging from low to shrill, and by means of suitable gearing the blowing, after continuing for a period of two minutes, is automatically cut off. To start the controller, it is merely necessary to press a push button switch, which closes the circuit and starts the motor driving the controller.

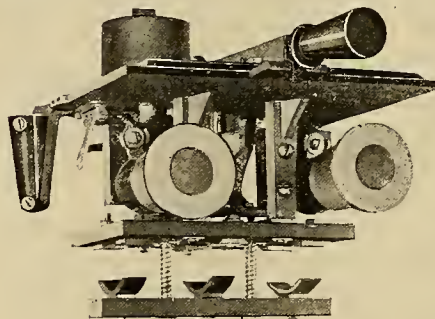
Another switch on the controller, as stated before, opens the motor circuit after two minutes operation, thus making practically an automatic device.

The motor is direct geared to the controller to insure a positive drive; the fingers are reinforced at the contact end and are of the "quick break" type and a holder provides for 1-inch take-up in case of wear. The contacts are removable and adjustable. The entire machine, including motor, is rugged and built for hard service.

Similar controllers are now being furnished by the Reynolds Electric Company to the City of Chicago for flashing "Stop" signals, gate lights, and ringing gongs when draw-bridge is open and gates are down, giving a positive alarm both by light and sound.

A Starting Switch that Protects the Motor

A motor starting switch should not only start the motor but should also protect it against overload and under-voltage. Various means have been devised to accomplish this dual function, of which one of the smallest and most effective is that illustrated herewith.



Starting Switch

The cut shows that the switch consists essentially of double break wiping contacts, controlled by an electro-magnet, and two inverse time-limit plugs. In case of failure of the current supply, or should the voltage drop approximately

50 per cent below normal, the magnet is de-energized sufficiently to release its armature, thereby operating the trip opening the switch.

The under-voltage release magnet uses a very small amount of energy and is absolutely positive in its action.

The overload protective plugs are of standard manufacture, and designed to operate or open the circuit at approximately 25 per cent beyond the rated full load current of the motor, when properly selected. These plugs are so connected in the circuit that when an overload occurs the fusible element blows, opening the motor circuit and releasing the magnet circuit. In the case of poly-phase motors they are in this way absolutely prevented from operating as single phase, which usually results in disaster to the motor. The fusible elements for these plugs can be replaced at a very small cost.

This switch has been approved by the Industrial Accident Commission of California and the National Board of Fire Underwriters. It is manufactured by the Wells, Morris Manufacturing Company of San Francisco, and designed in single-phase motors of 3 horsepower capacity or less, and poly-phase motors of 5 horsepower or less.

BOOKS AND BULLETINS

Government Publications

In "Methods for Increasing the Recovery from Oil Sands," published by the Department of the Interior, Washington, D. C., are considered the principles involved in increasing recovery and methods of extracting more oil from the oil-bearing formations than by the usual ways of pumping.

"Gas-Mantle Lighting Conditions in Ten Large Cities in the United States" is a recent publication of the Bureau of Standards and sold only by the Superintendent of Documents, Government Printing Office, Washington, D. C.

A new publication of the Bureau of Standards entitled "A Method for Testing Current Transformers" describes a method which will be found useful in commercial plants where delicate laboratory equipment is not available and where large numbers of transformers must be tested rapidly and with moderate accuracy. Two of the most convenient of the possible modifications of the general method are described in detail.

First Annual Report of the United States Tariff Commission submits a statement of the method adopted and all expenses incurred, and a summary of all reports made during the year of 1916-17 of the administration, and the fiscal and industrial effects of the customs laws of this country, including their relation not only to the Federal revenues, but to the industries of the country.

A census of brass, bronze and products for 1914, has been prepared by W. M. Steuart, chief statistician for manufactures, Department of Commerce, Washington, D. C. This bulletin contains a summary and analysis of the industry, with special statistics relating to products.

A publication of the War Trade Board recently issued covers the government rulings to date in regard to exports and imports, enemy trade and transportation, and supplements the enemy trading list.

Mining Bulletins

Bulletin 159 of the Bureau of Mines gives "Abstracts of Current Decisions" on mines and mining, including several which deal with electrical apparatus as used in mines.

"The Mining Industry in the Territory of Alaska," is the subject of Bulletin 153 of the Bureau of Mines, just published. The author is Sumner S. Smith, United States mining inspector.

"Gypsum Products," their preparation and uses are treated in an illustrated publication by R. W. Stone, gotten out by the Bureau of Mines. The work has been prepared with the co-operation of the U. S. Geological Survey.

"Firing Bituminous Coals in Large House Heating Boilers," by S. B. Flagg, is the title of Technical Paper No. 180 of the Bureau of Mines. In the back of the pamphlet is a list of publications on the utilization of coal and lignite.

Miscellaneous

"Dam Sites on the Missouri River in South Dakota" contains many maps and illustrations as well as careful descriptions of construction features. The South Dakota Department of Irrigation has published this bulletin.

"How Does Industrial Valuation Differ from Public Utility Valuation?" is the bulletin form of the paper presented before the American Society of Technical Engineers, New York, by John H. Gray. The author deals with the valuation of franchises, the question of surpluses, losses sustained under public control and cites numerous court decisions and opinions on economics.

"The Straight Road to Financial Independence," by Wm. H. Dodge, embodies concise pointers on sensible investment versus speculation.

Waste in Boiler Rooms

A new publication, "Finding and Stopping Waste in Modern Boiler Rooms," has been gotten out by engineers of the Harrison Safety Boiler Works, Philadelphia. The book is a compilation of recent authoritative information on the design, management, and operation of steam boiler plants. It is divided into five sections, the first of which is about "Fuels." The other four sections include "Combustion," which takes up the chemistry of that process; "Heat Absorption," "Boiler Efficiency and Boiler Testing," "Boiler Plant Proportioning and Management." The book has been compiled by George H. Gibson, Member American Society Mechanical Engineers, assisted by Percy S. Lyon, now Captain of Coast Artillery.

Of Interest to the Trade

The Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., has just issued an eight-page booklet (known as Booklet T), illustrating and describing the Thomas meter for the accurate commercial measurement of gases and air in large quantities. The booklet gives the principle of operation, illustrates essential parts and shows typical installations.

An attractive booklet covering the Electric Space Heater Unit for use in small spaces has recently been given out by the Cutler-Hammer Company.

A circular calling attention to the Hotpoint Maid window display has been sent as a reminder to electrical dealers as well as announcement of the granting of a patent for Hed-lite Heaters.

An attractive bulletin describing sales helps for electrical dealers, gotten out by the Robbins & Myers Company of Springfield, Ohio, has recently been given to the trade.

Book Catalogues

Longman, Green & Co., publishers, have issued their catalogue of scientific books for January and February.

D. Van Nostrand Company, 25 Park Place, New York, have just issued their descriptive list entitled "Books of the Year."

A price list of publications gotten out by the McGraw-Hill Book Company, including the titles formerly published by the Clark Book Company, has been issued.

BOOK REVIEW

Hydro-Electric Power Stations

by Eric A. Lof and David B. Rushmore; size 9 x 6 in.; 822 pp.; published by John Wiley & Sons, and for sale by the Technical Book Shop, San Francisco. Price \$6.00.

The increased industrial demands of this country, the gradual decrease of our coal resources and present acute coal situation point directly to the fact that our water power must be developed to its fullest extent and large hydro-electric power plants installed as soon as possible. This latest addition to technical deliberation on this subject should receive a hearty welcome from both student and engineer, for the authors have handled the subject ably. They deal quite thoroughly with hydraulics and electricity in their relation to power plants and they have made especial study of the problems which arise in connection with such plants. One of the most useful and practical chapters in the book is that dealing with the economical aspects, which should be invaluable to both students and engineers. The actual cost of a large number of power plants is given at length as well as considerable other information which has not been available hitherto. The authors call their work an educational treatise; it should certainly find a place among the present college text-books.

NEW ELECTRICAL DEVELOPMENTS

(In the Northwest interest centers in the expansion of the various municipal electric interests. The time on bids for the Ruby Canyon contract has been extended by Seattle to March 15th. In the South, application is soon to be made to the government for two million dollars to cover an irrigation project in New Mexico which involves the erection of a large hydro-electric plant at Montoya. The construction of telephone and transmission lines to the new naval base at Riverside is the latest of the war services which have been characteristic of recent events.—The Editor.)

THE PACIFIC NORTHWEST

VANCOUVER, B. C.—Ontario Power Company has appropriated \$1,800,000 for additions to its plant.

CHILLIWACK, B. C.—The cost of reconstruction of the telephone lines of the Chilliwack Telephone Company, recently damaged by storms, is estimated at \$19,500.

PELL, WASH.—The North Coast Power Company of Chehalis, it is reported, is contemplating extending its electric transmission lines from Pell to Meskill.

MORTON, WASH. — Robert Bailey has purchased the Morton Telephone Company. He will make repairs at once and will practically rebuild the system in the spring.

LA GRANDE, WASH.—Plans have been made by the American Nitrogen Products Company for the installation of three electric ovens to provide for increased capacity.

ELLENSBURG, WASH.—Henry C. Mills and others have petitioned the county commissioners for a 50 year franchise to construct and maintain an electric line over certain highways.

SPOKANE, WASH.—Plans and specifications for the Post street ornamental curb lighting system, which is estimated to cost \$37,740, were passed by the city council without opposition.

McMINVILLE, ORE.—The installation of the new street lighting system, consisting of 75 series incandescent lamps of 75 candlepower, is nearly completed. P. E. Thornton is superintendent.

TACOMA, WASH. — Ordinance has been introduced authorizing the transfer of \$25,000 to the light and water reserve fund for double tracking certain portions of the municipal car line.

CHEHALIS, WASH.—Application of O. E. Anderson and others for a light and power franchise has been refused. The city is being served at the present time by the North Coast Power Company.

BELLINGHAM, WASH. — Farmers' Mutual Telephone Company has voted in favor of issuing bonds in the sum of \$20,000 to restore its lines, about 50 per cent of which were destroyed in the recent flood.

BREMERTON, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 4, for the erection of telephone and power transmission lines at the navy yard, Puget Sound.

SEATTLE, WASH.—Contract for furnishing 500,000 incandescent lamps for the lighting department of the city of Seattle has been awarded to the Pacific Lamp & Supply Company, Prefontaine Building, at approximately \$100,000.

SEATTLE, WASH.—City is to make another attempt to seal the Cedar River impounding basin. A bill calling for \$5000 from the light fund for this purpose has been introduced. Something like \$20,000 will be required for the work.

PORT ORCHARD, WASH.—The Puget Sound Pulp & Power Company has petitioned the commissioners of Kitsap county for a franchise to erect and operate electric transmission lines over the highways of the county for a period of 25 years.

MARSHFIELD, ORE.—The C. A. Smith Company is to enlarge its electric plant. Foundation work has been completed for installing electrical equipment. Machinery for a second unit to the extent of \$80,000 is on the way from Schenectady.

WENATCHEE, WASH.—The Wenatchee Valley Gas & Electric Company, according to an announcement made by Geo. D. Brown, president, has decided to build a power plant of 1000 horsepower capacity at Chelan Falls. The plant will be in operation by July 1.

BELLINGHAM, WASH.—It was reported some time ago that the Boundary Red Mountain Mining Company's power plant was damaged or destroyed by fire, and the report has just been confirmed. It is estimated that it will take all summer to get a new plant ready for operation.

TACOMA, WASH.—The city council has practically decided on the site near Mineral on which to erect the proposed new unit of the municipal power plant, to cost between \$750,000 and \$1,000,000. N. L. Taylor, engineer of the light department, has charge of boring test holes to locate bedrock at the site.

TACOMA, WASH. — Northwest Electric Company, 760 Commerce street, has completed the wiring of about 1800 buildings for the government at Camp Lewis, near Tacoma, and is working on the Y. M. C. A. building there, also the Cassidy & McKee building and theater building on the grounds of this camp.

PORTLAND, ORE.—S. C. Jagger of the Morrison Electric Company, and J. H. Sroufe, formerly representative of the NePage-McKenny Company of Seattle, it is reported, have secured a contract for electrical installation in 20 ships under construction for the Republic of France by the Foundation Company of Portland.

SEATTLE, WASH.—Star Machinery Company, operating an extensive plant for rebuilding machinery at 1731 First avenue, South, Seattle, has taken out a permit to erect a \$10,000 shop at 207 Horton street, and among other new equipment will install a 15 ton electric crane to run the full length of a 120 foot building.

DAVENPORT, WASH.—The Inter-mountain Power Company has made application to the county commissioners for a franchise to use certain highways in the construction and operation of a two-pole transmission line extending from Long Lake to the Adams line near Odessa. The total length of the line in Lincoln county will be about 70 miles.

TACOMA, WASH.—Superintendent Evans of the light and water department has announced that a permit has been issued for the placing of conduits underground from the Nisqually sub-station at Twenty-third and C streets, to Winthrop avenue. These will be the first underground conduits in Tacoma. The new conduits will be for the shipyards and tideflats.

SPOKANE, WASH.—Spokane, Seattle, and other Northwest cities are to join in a request to Congress for the inclusion of a provision in the new administration water power bill that will permit municipalities to develop water power projects upon government land and give them the right to govern their own publicly owned utilities which secure their supplies of power from such sites.

SEATTLE, WASH.—The city light department has made arrangements with the Stimson Mills Company to supply the department with 1500 kilowatts to assist in providing for the extra demand for power. An additional 600 kilowatts will be obtained from the small hydro-electric plant, which was built to utilize the excess water from the Volunteer Park reservoir, but which was never put to use.

GOLD HILL, ORE.—The Utah Mining Properties, located about 12 miles from Gold Hill, have been acquired by O. C. Runnalls of Seattle, Wash., and associates. The new owners contemplate the erection of an electric transmission line, about 5 miles long, to connect with the lines of the California-Oregon Power Company. It is proposed to equip the mines with electrically operated machinery.

SEATTLE, WASH.—Board of Public Works has changed the date of receiving bids for the Ruby Canyon light and power project on the federal reserve from March 1st to March 15th, at 10 o'clock a. m. This is the project at which the city proposes to produce 33,000 horsepower as the initial unit. Bids will be received at the same time for a completed hydro-electric plant that may fall outside of the federal reserve.

CLE ELUM, WASH.—The council has passed an ordinance granting South Cle Elum a franchise to construct, operate and maintain along, under and across certain streets in Cle Elum, wires, pipe or other forms of conduit for the purpose of conducting electricity, air, gas, water or other form or medium of communicating heat, light and power. Franchise is also granted for erecting wires for the transmission of telephone or telegraph service.

EUGENE, ORE.—A report of the proposed improvements of the power plant at Waterville has been submitted by N. C. Nelson, engineer of the water and light board, which recommends the construction of a wing dam on the McKenzie River to develop 3000 horsepower. The plant now has a generating capacity of 2400 horsepower, and it is recommended that a gate be placed in the forebay to accommodate a second penstock later to supply a third unit. The plant is now built in two units.

PACIFIC CENTRAL DISTRICT

CHICO, CAL.—The contract for the furnishing of electricity to the electrolier system was awarded to the Northern California Power Company.

HANFORD, CAL.—The People's Ditch Company of Hanford, it is reported, is considering the construction of a new electric light and power plant for local service.

RED BLUFF, CAL.—E. A. Rollinson, city engineer of Redding, is compiling data for the city trustees of Red Bluff with a view to establishing a municipal unit of electric lighting for the city.

REDDING, CAL.—The city trustees have instructed the city attorney to draft an ordinance calling for a \$40,000 bond election, the money to be used to build or acquire the proposed city lighting system.

LODI, CAL.—Among the improvements contemplated to the municipal electric lighting system are the installation of voltage regulators and additional one-lamp electroliers. John A. Henning is superintendent.

REDDING, CAL.—The electric power plant, planing mill and boiler house of the Shasta Land & Timber Company, of Redding, it is reported, was recently destroyed by fire, causing a loss of about \$50,000.

JACKSON, CAL.—Poles are being hauled to the Fortuna Italian Camp mine near Bellevue to be used for an electric power line. It is the intention of the company to build a hoist and install a mill this spring.

CALISTOGA, CAL.—The State Railroad Commission has authorized the Calistoga Electric Company to sell its electric distributing system in and about Calistoga to the California Telephone Company of Santa Rosa at \$28,900.

YOSEMITE, CAL.—The Treasury Department at Washington has petitioned Congress for authority to use \$5000 of the revenues of Yosemite National Park to complete the new hydro-electric power plant in the park.

SAN FRANCISCO, CAL.—A dividend of \$1.50 per share on the preferred stock of the San Joaquin Light & Power Company was declared February 14th to stockholders of record February 28, 1918, payable March 15, 1918.

SAN FRANCISCO, CAL.—The Asher Electrical Company, 607 Howard street, San Francisco, has been awarded the contract for the installation of a street lighting system and the interior wiring of the barracks buildings at the camp at Angel Island.

RICHMOND, CAL.—The Pacific Telephone & Telegraph Company has informed the Merchants' Association that they will co-operate with them for the beautifying of MacDonald avenue by removing all poles from the street, if it is decided to install electroliers.

FRESNO, CAL.—A petition of the residents of South Van Ness avenue for a permit to erect electroliers from Kern street to California, has been referred to the committee and Electrician T. M. Robinson has been asked to get figures on the cost of concrete and castiron posts.

ALPAUGH, CAL.—The new substation of the San Joaquin Light & Power Company, which is to supply electricity to operate the pumps for irrigating 8000 acres in the Alpaugh irrigation district, has been completed. The substation is equipped with three 500 kilowatt transformers and is supplied with electricity from the Corcoran generating station.

COLUSA, CAL.—Eight dredgers are on their way to Colusa to undertake an irrigation project which is to water 10,000 acres of rice land, located four and a half miles west of Colusa on both sides of the highway. The ditches are to be ready for operation by April 15. Rights of way have been purchased from the Tuttle Land Company of this city, and the completion of the project will involve the expenditure of \$250,000 and will give employment to 300 men.

SAN FRANCISCO, CAL.—The extension of the Municipal Railroad into the Sunset District and condemnation of a strip of land 300 feet wide from Market and including Capp street to the county line as a means of giving municipal car service through the Mission District, is a plan which City Engineer M. M. O'Shaughnessy has advocated in an address before the city planning section of the Commonwealth Club. Mr. O'Shaughnessy outlined transportation problems in San Francisco.

SAN FRANCISCO, CAL.—Work has begun on the construction of the shipbuilding plant of the Pacific Coast Shipbuilding Company at Bay Point. The buildings will include a plate shed, 80 feet by 400 feet, two stories; machine shop, 120 feet by 400 feet, one story; a large warehouse, power house, an office building, planing mill, etc. The launching ways will be 500 feet long, 53 feet wide, with 95 feet clearance between. Aerial trolleys will be used for the transportation of supplies. The cost of the plant is estimated at \$500,000.

STOCKTON, CAL.—The voters of the West Side Irrigation District, centering at Tracy, a few days ago voted on an issue of \$100,000 bonds needed to complete the system. The original bond issue was found inadequate, owing to increasing construction costs. The second issue, with the sum already authorized, will increase the indebtedness of the district to \$34 per acre. The system is rapidly nearing completion and will be ready for use this summer. Water will be pumped from Old River and carried to higher levels by a system of canals and big electric pumps.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Supervisors for installing an addition to the ornamental street lighting system.

FULLERTON, CAL.—Necessary funds are to be raised by subscription for the installation of street lights here. As a beginning, nine lights will be installed on the principal corners.

ESCONDIDO, CAL.—Ranchers of San Pasqual Valley are taking up the matter of irrigation plants with much interest. San Pasqual will soon be irrigated in a modern way, with wells and electrically driven pumps.

LOS ANGELES, CAL.—The plan to have the Pacific Electric Railroad place its tracks closer together on the trolley way through Venice to Ocean avenue, Santa Monica, is again being agitated by city officers of both cities.

LOS ANGELES, CAL.—At the request of the government, and as a special war measure, the Pacific Electric, it has been announced, will immediately double-track its line between Long Beach and the harbor. The construction job will cost at least \$200,000.

DOUGLAS, ARIZ.—Permanent organization of the Agua Prieta Light & Water Company is to be perfected at a meeting to be held at that place. It is planned to organize a \$30,000 corporation and build an electric light and water plant to supply the border Mexican city.

PALMDALE, CAL.—Preliminary stages of the formation of the Palmdale Irrigation District have met with success. The dam will be located three miles above the present head-gates of the water company, and will be built along multiple arch lines, the cost being estimated at \$300,000.

SAN BERNARDINO, CAL.—A project to convert the Antil steam pumping plant into an electrical plant is under consideration by the water department. Figures compiled by the commission indicate that the Antil plant could be operated considerably cheaper by electricity than by steam.

LOS ANGELES, CAL.—The Southern Sierras Power Company has joined with the Corona Gas & Electric Light Company, the Bishop Light & Power Company, the Rialto Light, Power & Water Company, and the Coachella Valley Ice & Electric Company, in seeking authority for the last-named four concerns to sell their properties to the Southern Sierras corporation.

REDLANDS, CAL.—Dike & Logie have announced that a contract for a first pump for the water system that will place water on all the Dunlap ranch tract and that part clear to Sunset Boulevard, has been let to Jackson-Church Pump Company of Los Angeles. The water system, which will supply that section of Yucaipa Valley now being thrown open, will cost in the neighborhood of \$150,000.

ROSWELL, N. M.—The Roswell Gas & Electric Company is installing two 256 horsepower Erie vertical boilers with Erie stokers, two boiler-feed pumps, with heaters and all auxiliaries, a 1200 square foot surface condenser on Allis-Chalmers engine, erecting a steel stack, 150 feet high, 6 feet in diameter, and also moving and raising three 200 horsepower Babcock & Wilcox boilers for stokers. C. M. Einhart is secretary.

PASADENA, CAL.—Maps are being prepared and complete data printed by the city describing in full the proposed rapid transit right of way between this city and Los Angeles, for which a bond election will be held April 20th. According to tentative plans, the total bond issue will be for \$700,000, if the terminals are provided for in the cost. The Los Angeles terminal, at the corner of First and Hill streets, will cost \$49,500, and the Pasadena terminal, \$115,676.

RIVERSIDE, CAL.—It is estimated that more than \$1,000,000 will be spent in building and equipping the new aviation base here. A mile and a quarter branch line will be constructed by the Santa Fe Railroad. The Southern States Power Company will extend its line to provide electric power: seven main trunk telephone lines will be installed by the Pacific Telephone Company, and the Western Union and Postal Companies will install offices.

RIVERSIDE, CAL.—Southern Sierras Power Company has made a proposition to the Board of Supervisors to light the road on Box Springs grade and in the Perris Valley to Alexandria, providing the aviation base is located in the latter place. The company offers, if a five year contract is entered into, to furnish equipment for the service without any charge to the city for equipment, and to furnish light at the usual rates. If the contract is made for a year, the county is asked to pay for the installation, with the amount refunded in power by the company.

LAS CRUCES, N. M.—Formal application will soon be made to the United States government for the advancement of \$2,000,000 to be used in the construction of an irrigation canal that is to lead from the diversion dam of the Elephant Butte reclamation project at Leasburg to Montoya, and for the installation at the latter place of a large hydro-electric plant. All money required for the proposed work is to be repaid by the project. The proposed hydro-electric plant is to provide power for operating industries and to supply energy in El Paso, Las Cruces and other towns along the transmission line.

THE INTER-MOUNTAIN DISTRICT

BILLINGS, MONT.—Clerk has been authorized by council to call for bids for installing street lights in Special Lighting District No. 3.

CHOTEAU, MONT.—H. and Alice E. McCullough et al. have formed the McCullough Electrical Company, with a capital stock of \$20,000.

HAMILTON, MONT.—The Misoula, Mont., Light & Water Company has offered to sell its water works system in Hamilton to the city for \$75,000.

MALTO, MONT.—Arrangements are being made for the installation of a new generator in the local electric light plant, which has already been purchased.

BURLEY, IDAHO—The farmers adjacent to Burley on the southwest are talking strongly of installing electric light and power by getting the line extended from Burley.

EUREKA, NEV.—Handley Brothers, it is reported, have decided to erect a power sheep-shearing plant (to cost about \$3000) at the Charley Minoletti ranch, about nine miles north of Eureka.

ABSAROKEE, MONT.—The hydro-electric power plant of the Absarokee Power Company will be completed and placed in operation in about a month. Edward R. Reher is manager.

CONRAD, MONT.—Frank Seal, manager of the Electric Equipment Company, of Great Falls, will install Conrad's new lighting system. C. P. Wells, consulting engineer of Great Falls, has charge of the work.

BRIDGER, MONT.—The Bridger Water & Light Company contemplates changing its system from direct to alternating current, provided equipment can be secured. J. S. Emmett is secretary and treasurer.

STRAWBERRY VALLEY, UTAH—Some repair work is being done on the water wheels at the power plant on the Spanish Fork River and petitions have been received from a number of districts desiring power.

LAMOILLE, NEV.—The Elko-Lamoille Power Company is contemplating improvements to its local system. The proposed work includes the construction of a new reservoir and piping the waters of the west fork of the stream into it with a pipe line 5000 feet long.

KENDRICK, IDAHO—The Potlach Consolidated Electric Company has placed orders for copper wire to replace the iron wire for the electric transmission line between Kendrick and Troy. The company is now installing three new transformers at its Troy station. A. Wilmot is president.

GOLD HILL, UTAH—Frank W. Ferris of Gold Hill, it is reported, is building a power plant on Trout Creek, about 48 miles from Gold Hill, to cost between \$40,000 and \$50,000. Electricity generated at the plant will be used at the mines in the Gold Hill, Clifton, Willow Springs, Fish Springs, Ferber and other mining districts.

MINIDOKA, IDAHO — The United States Reclamation Service reports that work on the transmission line to Melcher mine was continued. Considerable delay and some damage was caused by storms on the summit of the mountain which the line crosses. Fair progress was made on the substation at the mine. There was no interruption to service at the power house during the month.

JOURNAL OF ELECTRICITY

VOL. 40 NO. 6

SAN FRANCISCO, MARCH 15, 1918

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Relief at last—



WEALTH unlimited is now released to national development in the final climax of a campaign waged by the Journal of Electricity—long and earnestly—for the upbuilding of the West. May this recent expression on the part of the chief executive soon unlock the vast power store houses of the West and thus conserve the

The White House, Washington,
19 February, 1918.

My Dear Mr. Secretary:

I have examined with care the memoranda and letters which you transmitted to me with your letter of the fifteenth. I fully share the views you express regarding the importance of the public service utilities as a part of our national equipment, especially in wartime. It is essential that these utilities should be maintained at their maximum efficiency and that everything reasonably possible should be done with that end in view. I hope that State and local authorities, where they have not already done so, will, when the facts are properly laid before them, respond promptly to the necessities of the situation.

I shall be glad to have you communicate with the local authorities whenever the information in your possession suggests that such a course is desirable and in the national interests.

Cordially yours,

(Signed) WOODROW WILSON.

Wm. G. McAdoo,
Secretary of the Treasury.

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VOLUME 40

SAN FRANCISCO, MARCH 15, 1918

NUMBER 6

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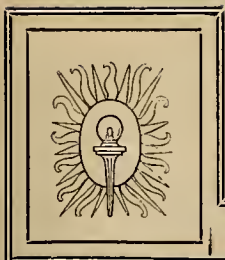
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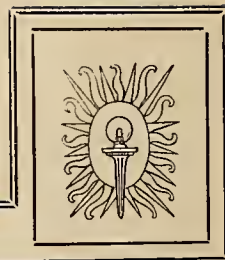


HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—IX

HERE is the longest span of wire in the world—the crossing of Carquinez Straits in Central California by the great transmission lines of the Pacific Gas & Electric Company. A horizontal distance of 4427 ft. is covered in a single stretch of wire that has a clearance of 206 ft. above extreme high tide. Though originally constructed in 1901, the addition of two more wires since the opening of the European conflict has made this record-breaking link in the world's greatest high tension transmission system of even more effective aid in its service for the industrial and agricultural upbuilding of the nation. Such instances as this not only render timely assistance to the nation in its fight for the democracy of the world, but add a wealth to the West which will last throughout all posterity.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, MARCH 15, 1918

Number 6

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THE DEMAND FOR GROWTH in broadened vision is imperative in these days of national crisis. Are you in your quiet moments expanding your ideas of human endeavor? Are you a bigger, better, more efficient citizen—freer from the thralldom of hatred and jealousy—in these hours of trial by fire?



The subject of interconnection of power systems of the West finds an exact counterpart in recent discussion of the super-power station which has just been approved by the British ministry of reconstruction for supplying all the industries in Great Britain. It is proposed to supply these industries by means of not more than sixteen big super-power stations located in favored sections of the British Isles, and thus eliminate or combine all the smaller stations. The primary object is to economize in coal supplies together with the saving of by-products now wasted by the burning of coal in open grates and boiler furnaces. It is estimated that an annual saving of half a billion dollars in operating expenditure is possible.

The committee's proposals rest on the assumption that electricity is the most economical and convenient form in which to apply power to industry, and that the only way to generate electricity cheaply is to generate it on a very large scale. The report only anticipates what electrical specialists have foreseen for years as the natural electrical development in a country like Great Britain, which is small in area, closely settled, and rich in coal. In view of these conditions, Great Britain is regarded as the country in all the world best situated to profit most from such a national monopoly of power.

It is interesting to compare this situation with that existing in the Pacific Coast states of the United States of America. The giant transmission lines of this section of the world, properly interconnected, make available a continuous supply of electrical energy that feeds an empire several times that of the British Isles, and could quite effectively serve energy to many of the European countries considered collectively. Indeed, a single line—that of the Southern Sierras Power Company, stretching from Wonder, Nevada, to Yuma, Arizona, a distance of eight hundred thirty miles, is more than of sufficient length to supply electrical energy all the way from Paris to Berlin.

In consideration of the fact that distances and areas in the West are so vast in comparison with the industrial centers of Great Britain and Europe, the possible accomplishments of hydro-electric practice in

the West show up even in a more fascinating and effective manner.

Charts recently compiled by the California Railroad Commission setting forth the normal increase in necessary power supply to meet the rapidly growing industrial and agricultural demands in north central California alone, indicate that as early as 1920, without further hydro-electric development being had, the total amount of fuel oil required for steam production of electric energy to supplement hydro-electric supply, would amount to 3,350,000 barrels annually, as against the use of approximately 1,000,000 barrels in 1916. When this ever increasing necessary production is projected to as comparatively an early date as 1922, the figures become almost appalling, and the necessity of taking immediate means to meet this demand in the West, by development of its hydro-electric resources of which there is a latent possibility of nine million horsepower in California alone, becomes imperative.

This is only one instance of the handwriting on the wall that super-hydro-electric power stations interconnected over the entire industrial and agricultural areas of the West, are even now a pressing demand.

In the present year of comparative light rain and snow precipitation, interconnection in some of the commonwealths of the West, notably California, will not perhaps bring about the great saving in power generation possible in normal years, as steam power supply will be of necessity largely used during the coming months. In normal years, however, the minimizing of steam generation and the interchange of storage and forebay facilities of the various power systems comprising the interconnected network will yield a very considerable return.

But the outstanding feature of the entire situation is that the recent utterances of President Wilson looking toward the unlocking of national water power resources for immediate development, for which principle the Journal of Electricity has striven so long and so earnestly, are timely, and evidence the fact that everything reasonably possible will be done at once to see to it that these shall be maintained at their maximum efficiency.

France, dearly beloved in the traditions of the American nation, has become so interwoven with the ideals and very life throbbing of the American Republic during recent months of trial, that it is questionable whether history has of record a more beautiful illustration of fraternal feeling among nations as instanced by these two great republics, the one in the Eastern and the other in the Western hemisphere.

It is questionable whether there exists a loyal American who does not each day in his yearnings toward France vow that in so far as his circumstances will permit, he will do all within his power to aid in her rehabilitation.

In the rebuilding of France the American engineer will undoubtedly contribute the leading part in technical skill, if not in outlay of actual money. At this period of the war, however, we can not and we must not divert material or physical effort that is so needed in bringing nearer the time when we may rebuild France, free from the possibilities of interruption or possible destruction of the philanthropic work American citizens feel for the great Republic of France.

It is well to remember that the slightest diverting of energies from the main issue—so long as that issue is still in the threatening attitude that it shows itself today—but weakens the cause of democracy in its struggle for the final liberation of all peoples and nations.

From earliest childhood we have all been familiar with the nursery rhyme about "Old King Cole was a merry old soul." While King Coal is still holding tyrannical sway in Eastern centers, it appears that in spite of vast possibilities of undeveloped hydro-electric resources in the West, and in spite of the growing agitation for fuel substitutes, still "Old King Fuel Oil" will reign supreme in electric generation in the West for months to come.

A chart recently drawn by a member of the engineering staff of the California Railroad Commission, shown on another page of this issue, is most illuminating. This chart shows the total power demand in the states west of the Rockies. In order to fill in the area of energy demand indicated upon the chart, a curve is next drawn for that portion of electric generation possible by coal, then upon this area is superimposed the energy generation possible from present fuel oil production, and lastly is shown an area that must be met by increased hydro-electric development or else there must develop a most serious crippling of industrial and agricultural activity in the West. By reference to this chart the rather startling conclusion is seen that the present hydro-electric development must double in five and treble in eight years to meet the natural increase in demand.

Upon carefully viewing the outstanding features of the situation as thus presented, we cannot but view with increasing concern the possible outcome of such an impending situation. Even though all conditions of finance and restriction in development upon the national domain be removed, months upon months and even years must elapse before this new hydro power could be brought to the market places as electrical energy.

In view of this fact it becomes obvious to all that increased power economy in both steam and hydro units must be brought about. Inefficient blades, losses in entrance and exit, losses in chimney gases and losses in steam generation must be studied with greater analytical effort.

It is interesting to note in passing that many of the great central stations of the West have already gone at this matter of overhauling power plant economy with an enthusiasm that is producing marked results. The splendid system of steam power plant economy measuring apparatus at the Long Beach Plant of the Southern California Edison Company, and the excellent results obtained in looking into hydraulic units and studying how efficiencies may be bettered in a number of hydro-electric plants of the West, are forceful examples of what can be accomplished along these lines.

Only by such careful study can the reign of old "King Fuel Oil" be made peaceful and harmonious and a reign that will bring about the desired results in industrial activity that will enable the national government to effectively cope with the enemies of the cause of democracy.

Electrification of railways is still a predominating point of discussion among electrical men the country over. The recent address of President Rice of the American Institute of Electrical Engineers at its midwinter convention is especially illuminating at this time.

On another page of this issue, P. M. Downing, operating manager for the vast system of interconnection of power systems recently brought about in north central California, alludes very forcefully to the ever-growing possibilities of electrification of railways.

One by one the hitherto apparently insurmountable difficulties standing out against electrification are disappearing. In the early stages of hydro-electric development, for instance, the shock that would be experienced in the generating system by having a sudden throwing on and off of a load of from five to six thousand kilowatts often proved serious.

The electrification of railroads in the West necessitates the handling of such fluctuating loads as this. The sinuous grades of the Tehachapi and the snowsheds of the high Sierra introduce factors in the electrification idea that at times appear insurmountable stumbling blocks for future electrification, especially since only single track facilities prevail on these lines.

It is gratifying to note in passing, nevertheless, that this ability to handle such huge fluctuating loads due to recent advances in transmission characteristics, brings one step nearer the ultimate time when the electrification problem may be undertaken with earnestness and zest.

If a general scheme of electrification were decided upon, the natural procedure would be as pointed out by President Rice, to electrify those portions of the steam railroads which would yield the greatest results and give the greatest relief from existing congestion, and it is a growing conviction on the part of every thoughtful student of the subject that electrification offers the quickest, best and most efficient solution that is to be obtained.

Old King Fuel Oil

An Electrification Difficulty Overcome

Steam power plant operators are finding in these days of fuel shortage that a close study of power plant economy is imperative. Hence a review of some of the helpful factors in fuel study and conservation that are available is most timely.

Helpful Factors in Fuel Conservation

First and foremost must be mentioned the educative and helpful influence of the universities and technical colleges of the West, such as the University of Washington, Throop College of Technology, the University of California and Leland Stanford Junior University. These institutions are not only prepared to train technical fuel oil specialists, but the eminent scientists and engineers upon their teaching staffs are contributing noteworthy research data for the upbuilding of efficient mining and utilization of this important national resource.

The university extension idea is proving exceptionally helpful. Take for instance the work that has been inaugurated at the University of California, where service is now being rendered to over three hundred thousand people in the state of California. Practically every conceivable educative aid is available through this branch of university instruction. All operators or engineers interested in fuel oil, its uses and conservation, may for a small fee enjoy this excellent service. The only other requirement on the part of the applicant is that he be thoroughly in earnest in undertaking such study.

Another important branch of service in the conservation of coal, petroleum and other fuels is that instituted by President Woodrow Wilson, who has appointed Dr. H. A. Garfield as national fuel administrator. Mr. Garfield in turn has appointed Mark L. Requa as oil administrator. Mr. Requa is a mining engineer of note and much is expected of him in helping to solve the fuel situation. In the administration of his work the oil industry will be left in great measure to govern itself. Insistence, however, will be made upon the oil industry that it maintain fair and reasonable prices and that it co-operate to the fullest extent in supplying most efficiently the products of petroleum needed to meet the requirements of our army, navy and allies. Mr. Requa has appointed an able corps of assistants and much good is bound to result from his labors.

The various utility commissions throughout the West and the respective state councils of defense are

contributing noteworthy effort in handling the fuel situation. The California Commission is doing excellent service in the handling of the petroleum situation. Authorized under the law to regulate the public utilities as to rates and other matters, this commission is now on its own initiative working out a scheme of interconnection of power companies in the state of California that will do much in conserving the fuel oil in that industry.

The recent report of the Committee on Petroleum for the California State Council of Defense contains an excellent series of conclusions and recommendations for fuel oil conservation.

Especial attention is called to the research investigations of the United States Bureau of Mines and the United States Bureau of Standards. Much helpful scientific data on fuel oil specifications and steam generation are to be gleaned from the various publications of the Bureau of Mines, while methods of standardization of thermometers and other measuring apparatus so necessary in these days of fuel economy are to be found in the helpful work of the Bureau of Standards. In discussions looking toward the production of petroleum the publications of the United States Geological Survey are timely, as are also the publications of the California State Mining Bureau.

The Book on Steam of the Babcock & Wilcox Boiler Works is perhaps the most helpful of its kind in existence in setting forth the elementary laws of steam engineering in a practical manner.

In regard to current aids in the technical press, the only paper in existence which devotes a regular department to the technical discussion of fuel oil and steam engineering is the Journal of Electricity, which is now in its thirty-first year of publication and is the recognized authority on this line of discussion.

The work of the Pacific Coast Section, N. E. L. A., along lines of fuel oil economy in steam power generation has proven most helpful. Through this means of expression the great power companies of the West which use oil as a fuel are contributing noteworthy aids to efficient uses of this product.

The American Society of Mechanical Engineers and the American Institute of Electrical Engineers constitute the two great national societies of professional status that are exceedingly helpful in fuel oil study.

THE NEW JOURNAL SERVICE: Due to an ever-increasing demand on the part of its readers and advertisers, the Journal of Electricity has instituted another most helpful branch of its activities, to be known as "Advertising Service." Readers of the Journal of Electricity desirous of getting notice of what is to appear in coming issues will always find in this place on the editorial page a terse statement of some of the leading features to be brought out in future discussions. As a forceful illustration of this service we herewith publish a miniature reproduction of our current mailing card to advertisers, setting forth the features of the convention issue of the Journal of Electricity, April 1, 1918. Incidentally, this card gives information of coming articles that deal in matters of great timely interest to users of electrical energy in the West.

JOURNAL OF ELECTRICITY

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Advertising Service

Our issue of April 1st will feature the convention papers of the Pacific Coast Section N. E. L. A., covering:

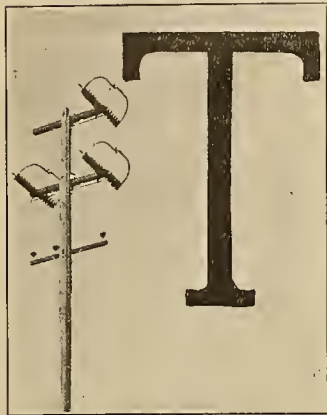
1. Increasing Business on Existing Lines
2. Practical Selling Methods
3. Industrial Electric Heating
4. Interconnection of Hydroelectric Lines
5. Practical Means for Increasing Efficiency of Existing Lines

JOURNAL OF ELECTRICITY

RECENT ADVANCES IN TRANSMISSION CONSTRUCTION

BY L. M. KLAUBER

(Poles, insulators, wire arrangement, questions of overhead crossings, and construction problems of high-tension transmission line work have been brought to the fore by the recent discussion of interconnections of power lines throughout the West. Details of the latest advances in design for apparatus of this nature are here given in a graphic and interesting way as they have been used in the San Diego tie-in line which forms the connecting link in the system which will reach from near Fresno down across the desert to the Mexican border. The author is superintendent of construction with the San Diego Consolidated Gas & Electric Company, and has himself been responsible for many of the recent advances in transmission line construction.—The Editor.)



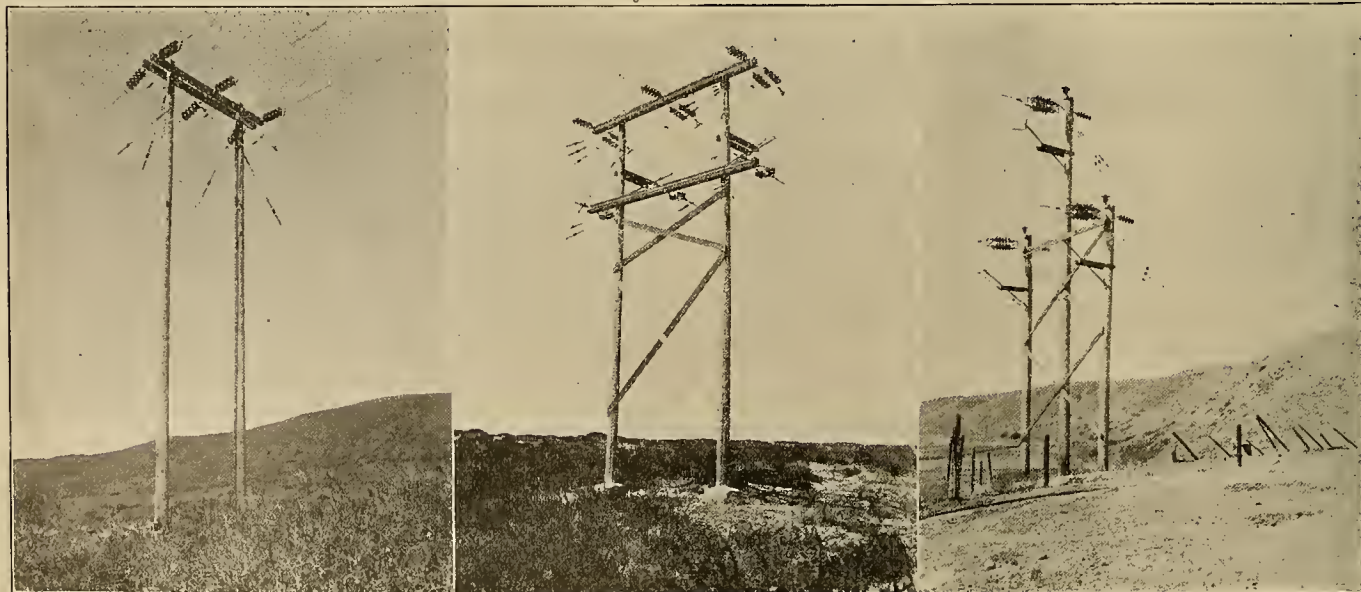
The line switches used are of the K-P-F type, rated at 88,000 volts. Note the mounting on the pole.

THE San Diego Consolidated Gas & Electric Company has recently completed a 78½-mile 66 kv. transmission line from San Diego to San Juan Capistrano, in Orange county, to tie the system of the San Diego company to that of the Southern California Edison Company at the latter point. Arrangements were consummated for the purchase of energy from the Edison Company in the spring of 1917, and work was begun on the transmission line as soon as the necessary material could be accumulated. The decision to purchase energy from the Edison Company was made primarily as an oil-saving measure, and when the terminal substations have been completed, a saving of 140,000 barrels of oil per year will be effected.

The Southern California Edison Company generates at 50 cycles, while the San Diego Consolidated Gas & Electric Company operates at 60 cycles. Fre-

quency changers are, therefore, necessary for interconnecting the two systems. The frequency changer substation will be located at San Juan Capistrano, and will be installed and operated by the Southern California Edison Company. This station is described on another page of this issue. The San Diego substation will be located in a portion of the steam plant at Tenth street and Imperial avenue, formerly given over to reciprocating units now removed. The transformer installation will consist of four 2000 kva. Westinghouse O. I. W. C., 66/11 kv. transformers, one being a spare. These are of the outdoor type, but will be mounted within the building.

The transformer bank will be connected star-delta, the neutral on the high tension side being grounded at both ends of the line. Transformers will be mounted on rails adjacent to a pit installed for expediting the removal from the case of the coils of any unit which may require inspection or repair. On the 66 kv. side air break switches only are provided. On the 11 kv. side a new bus system is being installed complete with General Electric K-22 and K-24 oil switches. These switches will control the 11 kv. side of the step-down transformer bank, the four out-going 11 kv. feeders and two transformer banks of 3000 and 1500 kilowatts capacity, respectively, stepping down from 11 kv. to 2300 volts. The main distribution from this station



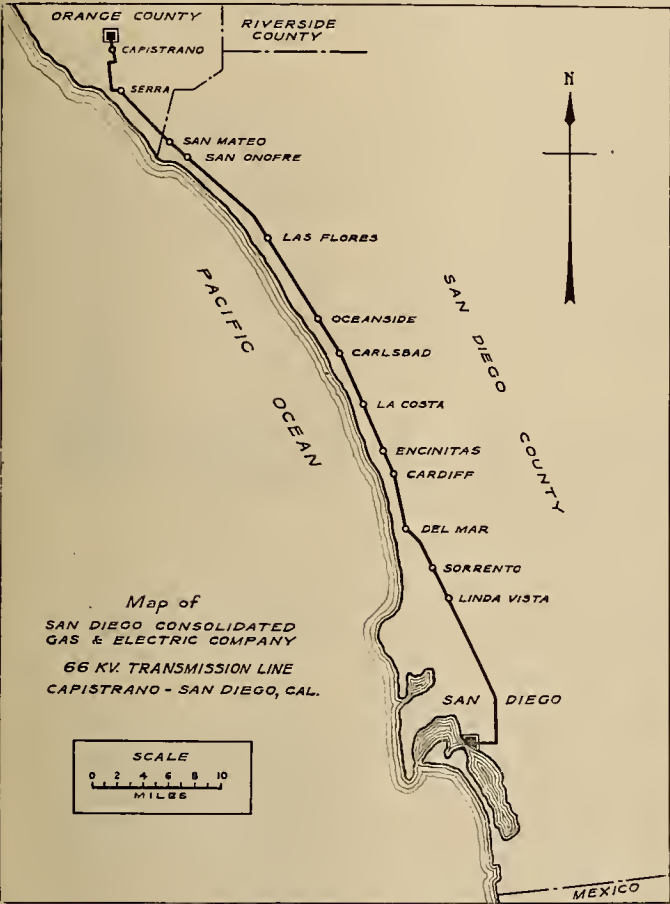
TOWER CONSTRUCTION FOR SPANS OF 600 FEET AND OVER

This is the lightest form of 2-pole tower construction for spans of from 600 to 1000 ft. (Type T). The conductors are in a horizontal plane with a separation of 6 ft. 6 in.

A 2-pole tower construction with cross bracing for spans of 1000 to 2500 ft. where adjoining spans are shorter than 1000 ft. The conductors have an 11-ft. separation. The same type of tower with minor changes is used where adjacent spans are longer. Note the concrete base for the poles set in marsh.

For spans of from 2500 to 3500 ft., where adjoining spans are shorter than 1000 ft., this 3-pole tower is used (Type S). The conductor arrangement is an equilateral triangle with a separation of 20 ft.

is at 2300 volts for use in the central district of San Diego, there being fourteen single-phase and seven 3-phase 2300 volt feeders. All of the 2300 volt and 11 kv. switches are electrically operated remote control. General Electric aluminum lightning arresters are being provided for the in-coming line; these will be located on the roof of the power plant. Out-going 11 kv. feeders will be equipped with General Electric low equivalent multigap arresters.



MAP OF THE CAPISTRANO-SAN DIEGO LINE
This line completes the interconnection of power lines in Southern California, which now stretch from Big Creek 400 miles down across the desert as far as Mexico.

The San Diego steam plant has a capacity of 14,600 kva., and this together with the transmission line having a maximum capacity of 10,000 kva., will be sufficient to serve the San Diego community for some time. For the present the steam plant will be operated mainly as a reserve. It is probable that one turbine will be kept floating on the line, primarily for voltage regulation.

In addition to the San Diego substation the transmission line will be tapped at Oceanside and at Del Mar. At the first point two 300 kva. 3-phase 66 to 11 kv. O. I. S. C. outdoor type Westinghouse transformers will be installed, and at the latter point one of the same size. Aluminum lightning arresters will be installed at each point. Transformers will not be protected with overload devices on the primary side, but on the secondary side General Electric K-12 switches are provided. Each substation will feed the local distribution in that district; the Oceanside substation feeding as far east as Escondido and San Pasqual, and as far north as Fallbrook and Las Flores.

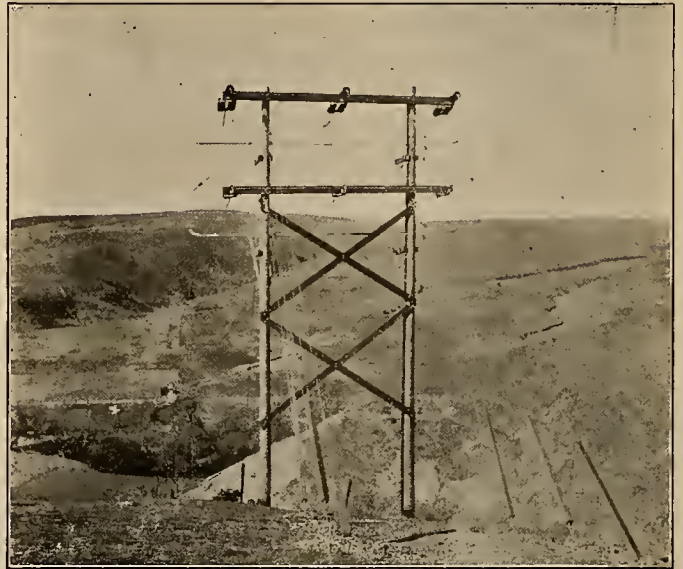
The transmission line is of wood pole construc-

tion throughout. That portion of the line between Del Mar and Oceanside was built during 1916, and has been temporarily operated at 11 kv. since January, 1917. The balance of the line has been built during the past year, having been completed early in February, 1918, and is now being operated at 11 kv., pending the receipt of substation apparatus by the Edison and San Diego companies.

A summary of the specifications of the transmission line is as follows:

Conductors

Except for the original portion of the line between Oceanside and Del Mar, where No. 2 solid copper was used, the line is built of No. 1, 7-strand, medium hard drawn, bare copper. All wire was tested by one of the commercial testing laboratories at the Eastern factories before shipment. On some of the long spans, steel conductors were used, especially on spans exceeding 1100 feet, of which there are 14. The steel ordinarily used is 7/16 inch, 7-strand extra galvanized special high strength (18,000 lbs.) quality, but on the longest span 7/16 in. extra galvanized extra high strength (22,500 lb.) steel is employed.



GUYING SYSTEM FOR TYPE S, 2-POLE TOWER

A span of 3069 ft., across Mission Valley river. The complete anchor system is shown. For long span towers on the back guys, the cable is of the same quality as the steel used as a conductor—elsewhere 3/8-in. extra galvanized steel is used. White No. 506 strain insulators are used in all guys to comply with the state law. However, as this insulator is admittedly electrically inadequate to the line voltage, the pole end of every guy is grounded. Pyramidal concrete anchors are employed except in marshy ground, where large treated wood slugs are installed. Anchor rods were 3/4-in. galvanized, 8 ft. long. Anchor boxes were employed where required for protection of persons.

Stringing Conductors

Copper conductors were sagged in accordance with the table shown. Foremen were given instructions never to string at less than these sags, although they were given permission to exceed the sags where required by special considerations, and where clearances were not unduly decreased. All long spans where steel is employed were sagged with a dynamometer.

Splices

Line wire splices in tension are made with Hickey & Schneider seamless copper splicing sleeves. Where splices are made on deadend poles between horizontal

strings of insulators, ordinarily three-bolt guy clamps are used, with several turns around the neck on each side of the clamp.

Spans

Spans are 440 feet on tangents in level country. Longer or shorter spans are employed, as dictated by topography. Spans are made shorter where passing through towns and on that portion of the line which is of twin circuit type. The maximum single pole span is 600 feet. On longer spans two pole structures are used. The longest span in the line is 3069 feet, where the line crosses the San Diego River. The south tower is at an elevation 100 feet above the north tower. The lowest point in the sag is 17 feet below the low tower. The wire tension is 8750 lbs. at 60° F.

Clearances

Minimum clearances were made as follows: Over rails of railroads or street railways, 34 feet; over streets, alleys or public highways, 30 feet; over telephone, telegraph or signal wires, 8 feet; over supply lines, 8 feet. As a matter of fact these clearances are ordinarily greatly exceeded.

Poles

Class "A" Western red cedar poles, with open tank treated butts were used as far as obtainable. Standard poles on tangents, twin circuit lines, are 60 feet; standard poles on tangents, single circuit lines, 50 feet; at corners, 55 feet.

Other lengths were used as required by topography, trees, buildings, intersecting wire lines, etc. Poles are set at the following depths:

50 feet	.....	7 feet
55 "	.....	7½ "
60 "	.....	7½ "
65 "	.....	8 "
70 "	.....	8 "
75 "	.....	8½ "

Poles are set in concrete on heavy corners in marshes; otherwise where the line traverses soft ground redwood mud sills are installed. Trussed poles set in concrete, or push braces are used where it is impossible to secure anchor rights.

On a portion of the line a sufficient supply of Western red cedar poles could not be obtained, and a number of Douglas fir poles were consequently installed. These make fine, strong, straight poles, but have certain objections, viz: after drying they are hard and consequently difficult to climb, and while weathering they tend to spiral slightly, thus twisting the cross-arms and necessitating straightening the line. Also the taper ordinarily averages about 1 inch in 15 feet or more, rather than 1 inch in 10 feet, as is the case with cedar, and therefore poles with larger tops are required for equal butts as compared with cedar. As to the lasting qualities of Douglas fir with open tank treated butts, under the particular conditions obtaining on this line, time alone will tell. Owing to the hardness of the wood, the penetration of the wood preservative is not as deep as with cedar.

Wire Arrangement

To aid in the proper issuance and simplification of orders and discussion of line construction, it was early decided to assign type letters to the various styles of crossarm arrangements used. In general, on the twin circuit portion of the line, three horizontal



AT A TELEPHONE CROSSING

A twin circuit construction (type 2-66 R) designed for straight away lines. It is primarily used at crossings over railroads and communication lines.



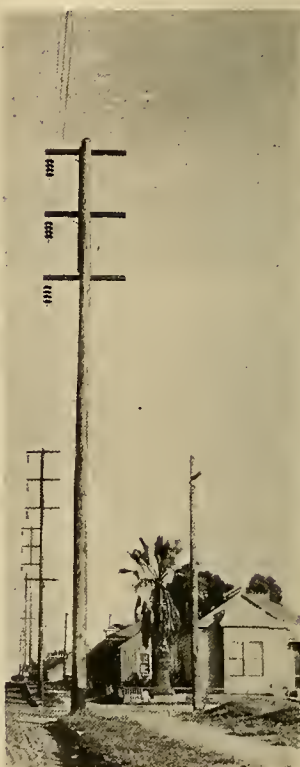
A STREET RAILWAY CROSSING

Type 2-66 X, is used for leading and turning angles of 15° to 174°. This is the dead-end construction with double strings of insulators in strain.



AN ANGLE POINT IN THE LINE

The same type as shown above (2-66 R) is used for angles between 170° and 180°. It is distinguished in each case by double strings of suspension insulators in suspension at an angle.



A STRAIGHT AWAY STANDARD TYPE

This is the standard twin circuit construction for city streets (type 2-66 W), used for straight away lines and angles between 174° and 180°. It is the ordinary type on tangents.

crossarms are used, the wires of each circuit occupying a vertical plane. The single circuit portion is constructed mainly with a triangular arrangement of the well-known Byllesby wishbone type. This is believed to be the most economical single circuit construction, for by its use the top wire of the triangle is raised to the level of the pole top, whereas if the crossarms were horizontal this wire would fall three feet below. Thus, under equal clearance conditions, this type of construction saves three feet of pole height. Furthermore, no braces are required, yet the construction is more

and 5 when used horizontally in strain. In single pole work and two-pole towers of the "T" type, single strings are used. In "U" and "V" construction parallel strings are employed, properly spaced and balanced by means of steel yokes; and in "S" construction there are 4 strings in parallel.

Attachment of Insulators

Insulators in suspension are attached to crossarms by means of "J" bolts and "C" hooks, a method which gives full flexibility at point of suspension in all direc-

		TABLE OF SAGS FOR VARIOUS TEMPERATURES																			
		N.B.M.D. STRANDED BARE COPPER CONDUCTOR																			
TEMP.	SPAN	100'	110'	120'	130'	140'	150'	160'	170'	180'	190'	200'	210'	220'	230'	240'	250'	260'	270'	280'	290'
44°		12"	13"	14"	15"	16"	18"	19"	20"	22"	23"	24"	25"	26"	27"	28"	29"	30"	31"	32"	33"
45°		13"	14"	15"	16"	17"	19"	20"	21"	23"	24"	25"	26"	27"	28"	29"	30"	31"	32"	33"	34"
50°		14"	15"	16"	17"	18"	20"	21"	22"	24"	25"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"
55°		14"	15"	16"	17"	18"	20"	21"	22"	24"	25"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"
60°		15"	16"	17"	18"	19"	21"	22"	23"	25"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"
65°		16"	17"	18"	19"	20"	22"	23"	24"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"
70°		16"	17"	18"	19"	20"	22"	23"	24"	26"	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"
75°		17"	18"	19"	20"	21"	23"	24"	25"	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"
80°		18"	19"	20"	21"	22"	24"	25"	26"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"
85°		18"	19"	20"	21"	22"	24"	25"	26"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"
90°		19"	20"	21"	22"	23"	25"	26"	27"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"	40"
TEMP.	SPAN	230'	240'	250'	260'	270'	280'	290'	300'	310'	320'	330'	340'	350'	360'	370'	380'	390'	400'	410'	420'
44°		2-4"	2-6"	2-8"	2-10"	3-0"	3-2"	3-4"	3-6"	3-8"	3-10"	3-12"	3-14"	3-16"	3-18"	3-20"	3-22"	3-24"	3-26"	3-28"	3-30"
45°		2-5"	2-7"	2-9"	2-11"	3-1"	3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"
50°		2-6"	2-8"	2-10"	3-0"	3-2"	3-4"	3-6"	3-8"	3-10"	3-12"	3-14"	3-16"	3-18"	3-20"	3-22"	3-24"	3-26"	3-28"	3-30"	3-32"
55°		2-6"	2-8"	2-11"	3-1"	3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"	3-33"
60°		2-8"	2-10"	3-0"	3-2"	3-4"	3-6"	3-8"	3-10"	3-12"	3-14"	3-16"	3-18"	3-20"	3-22"	3-24"	3-26"	3-28"	3-30"	3-32"	3-34"
65°		2-9"	2-11"	3-1"	3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"	3-33"	3-35"
70°		2-10"	3-0"	3-2"	3-4"	3-6"	3-8"	3-10"	3-12"	3-14"	3-16"	3-18"	3-20"	3-22"	3-24"	3-26"	3-28"	3-30"	3-32"	3-34"	3-36"
75°		2-11"	3-1"	3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"	3-33"	3-35"	3-37"
80°		3-1"	3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"	3-33"	3-35"	3-37"	3-39"
85°		3-2"	3-4"	3-6"	3-8"	3-10"	3-12"	3-14"	3-16"	3-18"	3-20"	3-22"	3-24"	3-26"	3-28"	3-30"	3-32"	3-34"	3-36"	3-38"	3-40"
90°		3-3"	3-5"	3-7"	3-9"	3-11"	3-13"	3-15"	3-17"	3-19"	3-21"	3-23"	3-25"	3-27"	3-29"	3-31"	3-33"	3-35"	3-37"	3-39"	3-41"
TEMP.	SPAN	375'	400'	425'	450'	475'	500'	525'	550'	575'	600'	625'	650'	675'	700'	725'	750'	775'	800'	825'	850'
44°		5-5"	6-2"	7-0"	7-7"	8-6"	9-0"	10-2"	11-5"	12-8"	14-1"	15-7"	16-1"	17-3"	18-1"	19-3"	20-3"	21-3"	22-3"	23-3"	24-3"
45°		5-7"	6-3"	7-2"	7-9"	8-8"	9-2"	10-4"	11-7"	12-10"	14-3"	15-9"	16-3"	17-5"	18-3"	19-5"	20-5"	21-5"	22-5"	23-5"	24-5"
50°		5-8"	6-5"	7-4"	7-10"	8-3"	9-3"	10-6"	11-9"	13-0"	14-5"	15-11"	16-5"	17-7"	18-5"	19-7"	20-7"	21-7"	22-7"	23-7"	24-7"
55°		5-10"	6-7"	7-6"	8-0"	8-5"	9-5"	10-8"	11-11"	13-2"	14-7"	15-1"	16-7"	17-3"	18-7"	19-3"	20-3"	21-3"	22-3"	23-3"	24-3"
60°		5-11"	6-8"	7-7"	8-2"	8-7"	9-7"	10-10"	12-1"	13-4"	14-9"	15-3"	16-9"	17-5"	18-9"	19-5"	20-5"	21-5"	22-5"	23-5"	24-5"
65°		6-1"	6-11"	7-9"	8-4"	8-9"	9-9"	11-0"	12-3"	13-6"	14-11"	15-5"	16-11"	17-7"	18-11"	19-7"	20-7"	21-7"	22-7"	23-7"	24-7"
70°		6-2"	6-11"	7-10"	8-6"	8-11"	9-11"	11-2"	12-5"	13-8"	15-1"	16-7"	17-3"	18-7"	19-3"	20-3"	21-3"	22-3"	23-3"	24-3"	25-3"
75°		6-4"	7-1"	8-0"	8-7"	9-0"	10-1"	11-4"	12-7"	13-10"	15-3"	16-9"	17-5"	18-9"	19-5"	20-5"	21-5"	22-5"	23-5"	24-5"	25-5"
80°		6-5"	7-3"	8-2"	8-9"	9-2"	10-3"	11-6"	12-9"	14-0"	15-5"	16-11"	17-7"	18-11"	19-7"	20-7"	21-7"	22-7"	23-7"	24-7"	25-7"
85°		6-7"	7-4"	8-4"	9-1"	9-4"	10-5"	11-8"	13-1"	14-2"	15-7"	16-11"	17-7"	18-11"	19-7"	20-7"	21-7"	22-7"	23-7"	24-7"	25-7"
90°		6-9"	7-5"	8-6"	9-3"	9-6"	10-7"	11-10"	13-3"	14-4"	15-9"	16-11"	17-7"	18-11"	19-7"	20-7"	21-7"	22-7"	23-7"	24-7"	25-7"

SAG TABLE USED FOR STRINGING CONDUCTORS
The sags may be exceeded under special circumstances, but it is not permissible to lessen them

rigid than that secured with parallel arms and braces, and this at the expense of only 2 feet 8 inches of additional crossarm length, the diagonal arm being 10 feet 8 inches in length, whereas the horizontal arm is 8 feet.

Crossarms

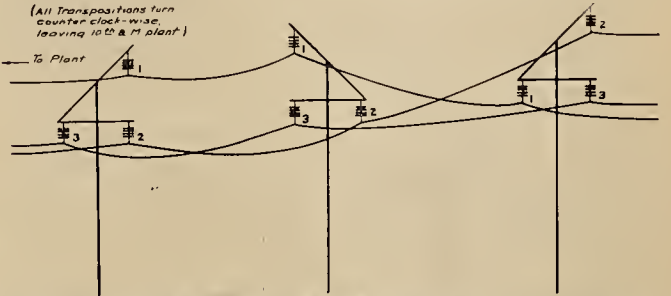
Crossarms are of clear, straight-grained Douglas fir, painted with two coats of yellow cement paint. A variety of sizes were used with the various types of construction above described. Crossarms on W and X construction have a cross section 3¾ inch by 5¾ inch. On U and V construction they are 9¼ inch by 9¼ inch.

Braces

Braces were not ordinarily required with the type of construction used. In the twin circuit construction, angle iron braces are installed.

Insulators

Locke insulators, No. 3538, are used as a standard. Four constitute a string in vertical suspension,

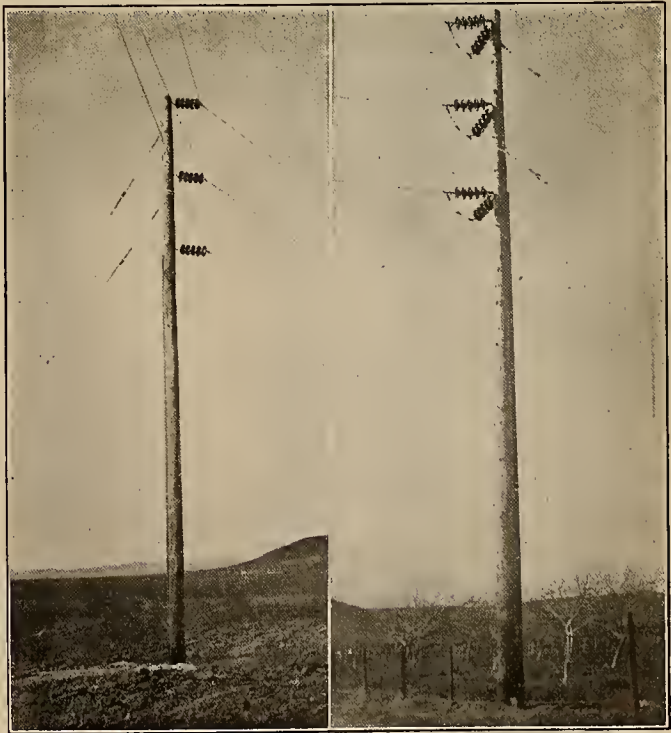


THE STANDARD TRANSPOSITION
Sixteen mile barrels are the rule. Transpositions are effected in single circuit construction by merely reversing one pole top. The turn is counter clockwise.

tions, and seems to obviate any tendency of the conductor to break close to the clamp. No. 4333 Locke suspension clamps are used; these are likewise of a flexible type. Horizontal strings of insulators are attached to poles or crossarms by means of universal deadend clevises, Hubbard No. 555.

Ground Guards

In accordance with the desires of the Railroad Commission, special angle iron ground guards were installed at all spans exceeding 1000 feet which cross over railroads, telephones or main traveled highways.



FOR TURNING CORNERS—TYPES Z AND Y
Vertical corner poles without crossarms. The Z pole on the left with single strings of insulators is designed for turning angles of 110° to 165° and 0° to 70°. The Y type at the right with double insulators is for angles of 70° to 110° and is primarily used at right angle turns.

SINGLE CIRCUIT CONSTRUCTION

Type 66 X, a typical dead-end pole of the single circuit type with insulators in strain for deadending and turning angles of 150° to 174° .

Type 66 R — for straight away lines and angles between 174° and 180° . This is a crossing pole with double strings of insulators in suspension but at an angle.

Type 66 W—for tangents and angles between 174° and 180° . This is a single arm wishbone type pole used on tangents and constitutes the great bulk on construction on this line.

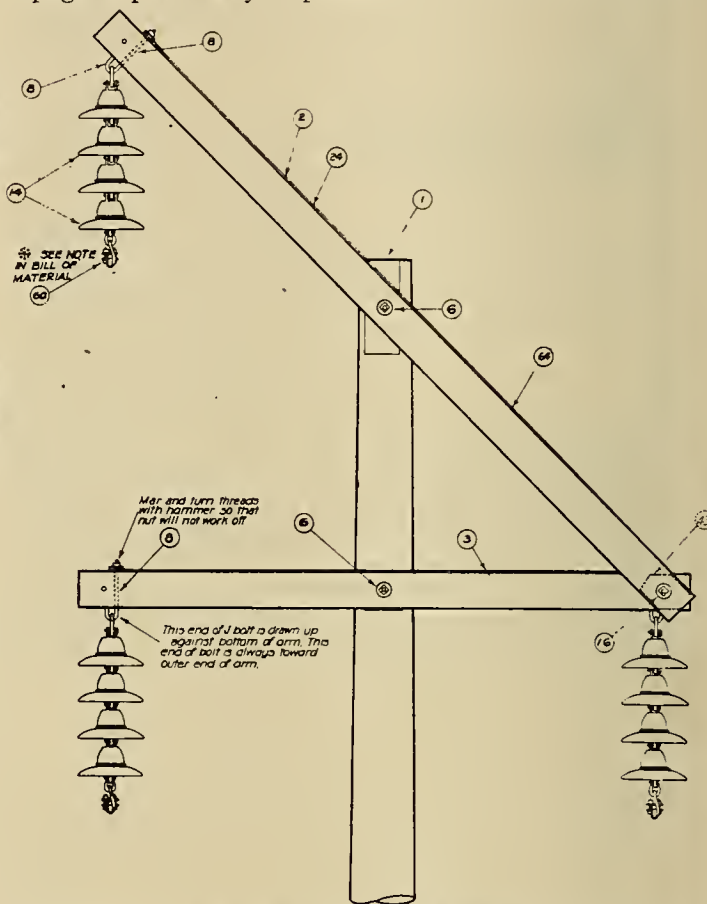
Type 66 Q—for turning angles between 165° and 175° . This is a "W" pole with a special holding down arm to keep the string which would tend to turn in toward the pole from swinging.

Grounding

As noted above, all poles to which guys are attached, are grounded. Poles having no guys have the pole ends of all insulator strings electrically connected together by means of a $\frac{1}{4}$ inch steel cable. On the twin circuit construction it is proposed to ground this interconnecting cable at the time the second circuit is installed. All vertical runs of grounding cable are covered with redwood moulding.

Deadend Clamps

Ohio brass No. 10755 strain clamps are installed at all deadend points where copper conductors are used. At long spans with steel conductors, some special patented clamps were employed, but these were later abandoned in favor of a simple pulley wheel, in order to give a large bending radius for the stiff steel cables used. A wheel of this type is more difficult to install than a deadend clamp, but once installed slip-page is practically impossible.



PLAN DRAWING OF CROSSARM

The details of construction are here clearly shown. This is type W shown across the page. As the prevailing winds in this section are from the west, two of the three wires along the main line are placed on the east side of the pole.

A study of the illustrations will show not only the methods of stringing insulators, but also the relative height and tapering of poles, method of guying and the like. Note the clearances over railroad crossings and telephone lines as indicated, and the varying type of cross arms. The base construction where shown is worthy of note, particularly the concrete foundation for marshy ground, illustrated in the case of the medium span tower construction. Further information on the frequency changer substation operating between this tie-in line and that of the Southern California Edison Company will be found on page 278.

PHYSICAL DATA OF THE HIGHEST VOLTAGE SYSTEM*

BY H. A. BARRE

(Terse data concerning the giant Big Creek hydro-electric development and transmission system of the Southern California Edison Company—now the most striking system of high voltage transmission in existence—will be found of great timely interest in these days of interconnection and thoughtful study in hydro-electric conservation. The author is electrical and mechanical engineer for this company and one of the most distinguished engineers of the West in matters of high tension design.—The Editor.)

Equipment Data

Two power plants, total capacity 64,000 kw.
Four 17,500 kva. generators.
Eight tangential water wheels; each pair develops 16,000 kw.
One generator, full load, 24 hours, uses 240 acre feet of water.
Maximum head of water: Plant No. 1, 2100 ft. static. Plant No. 2, 1900 ft.
Reservoir capacity, 88,000 acre feet. Cubic yards concrete in dams, 250,000.
Drainage area, 79 square miles.
Five miles of 12 ft. tunnels through solid rock.
Single phase transformers, largest yet built, weigh 81 tons and contain 10,000 gals. of oil.
Power station transformers connected delta 6600 volts, Y 150,000 volts, with grounded neutral.
Receiving station transformers connected delta 150,000 volts, delta 60,000 volts and 18,000 volts respectively.
Two 15,000 kva. synchronous condensers at receiver end each require 10,000 kva. to start.
Under no load conditions, 137,000 volts at generator rises to 150,000 volts at receiver.
Charging current is 90 amperes at 137,000 volts, equals 21,500 kva.
Fifty amperes reversed excitation necessary to bring generator "down on line" to zero potential, no load condition.
Power factor of generators is high, being above 95 per cent the greater part of the day.
Current in unbalanced approximately 12 per cent under no load conditions on account of the conductors being in horizontal plane.
Under normal load conditions, above 12 per cent is reduced to approximately 2 per cent.
A potential of 4200 volts is induced in a dead section of the duplicate line 100 miles in length, distant 32 ft. center to center.
Line loss at full load is 9½ per cent. In addition, there is 5 per cent loss in transformers, auxiliaries, etc.

Data on Big Creek Transmission Line

General—
Length, 240.41 miles power house No. 1 to Eagle Rock sub-station, plus 0.74 mile tap to power house No. 2; total, 241.15 miles.
Voltage, 150,000 volts, 50 cycles.
Number of tower lines, 2.
Number of circuits per tower line, 1.
Capacity of each circuit, 57,500 kw. at 0.85 power factor for 11 per cent regulation, using synchronous condensers.

Right of Way—
Width of right of way, 150 ft.
Separation of center lines of tower lines, 82 ft.

Towers—
Normal spacing in valleys where no sleet occurs, 660 ft.
Normal spacing in valleys where sleet occurs, 590 ft.
Maximum span, 2671 ft. (Sunland), 2776 ft. (Kings River).
Maximum span on standard towers, 1822 ft.
Maximum angle on standard tower, 0 deg. 49 min. (Normal span no sleet, 1½ deg. plus wind. Insulators take 45 deg. position).

Maximum angle on anchor towers, 48 deg. designed for 60 deg. 114 deg. 2 min., under special conditions at tower No. 1.
Total number of towers, both lines, 3388.
Average number of towers per mile, single line, 7.05.

Classification.	Standard	Anchor and Angle	Special
Weight above foundation.....	4300	6450	4485
Weight of steel footings.....	1305	1605	1305
Total steel per tower.....	5605	8055	5790
Spread at base with line	20 ft.	24 ft.	20 ft.
Spread at base across line.....	18 ft.	24 ft.	18 ft.
Height above ground to insulator support	43 ft.	37 ft.	43 ft.

Unit Stresses—
Tension = 20,000 lbs. per sq. in.
Compression = $\frac{16,000}{1 + \frac{L^2}{36,000 R^2}}$ lbs. per sq. in.
 $\frac{L}{R}$ — for corner posts, 125.
 $\frac{L}{R}$ — for bracing, 175, except where a larger value is approved by the purchaser.
Minimum thickness of members, 3/16 in.
Unit stress in bolts:
Shear 15,000 lbs. per sq. in.
Bearings 30,000 lbs. per sq. in.

- Standard Towers (Design Assumptions)—**
- (1) Wind load, 22½ lbs. per sq. ft. of exposed area, with or at right angles to the line; wind pressure simultaneously applied to both faces of tower, and
 - (2) A pull in the direction of the line of 4250 lbs. at the points of support of two adjacent conductors pulling on the same side of the tower, and
 - (3) A vertical load of 1000 lbs. at each conductor support where conductor is unbroken, and of 530 lbs. at each ground wire support, and of 500 lbs. if conductor is broken, and
 - (4) A wind load of 600 lbs. at right angles to the line at each conductor support where conductor is unbroken, and of 300 lbs. at right angles to the line at each conductor where conductor is broken, and of 500 lbs. at each ground wire support.

The above loads are simultaneously applied.
Ground wire support designed to withstand an unbalanced pull of 5000 lbs. in the direction of the line.

- Anchor and Angle Towers (Design Assumptions)—**
Anchor and angle towers are designed for each of the following groups of conditions, only one of which groups is to be taken at a time:
- I. (1) A wind load of 22½ lbs. per sq. ft. of exposed area, with or at right angles to the line; wind pressure applied simultaneously to both faces of tower, and
 - (2) A pull in the direction of the line of 8000 lbs. at each of the three conductor supports, on either side of tower, and of 5500 lbs. at each ground cable support, and

- (3) A vertical load of 500 lbs. at each of the three conductor supports and of 260 lbs. at each ground cable support, and
- (4) A wind load of 500 lbs. at each of the three conductor supports, and of 250 lbs. at each ground cable support.
- II. (1) A wind load of 22½ lbs. per sq. ft. of exposed area, with or at right angles to the line; wind pressure applied simultaneously to both faces of tower, and
- (2) A pull at right angles to the line of 8000 lbs. at each of the three conductor supports, and of 5500 lbs. at each ground cable support, and
- (3) A vertical load of 1000 lbs. at each of the three conductor supports and of 265 lbs. at each ground cable support, and
- (4) A wind load of 600 lbs. at each of the three conductor supports and of 500 lbs. at each cable support.
- Number of conductors supported by each tower, 3.
- Arrangement, in same horizontal plane.
- Number of lightning ground wires, one at first; space for two if needed.
- Smallest size angle iron used, 1¾ by 1¾ by 3/16 in.

Conductor—

Material, aluminum with steel core; steel double galvanized.

Composition:	No. Strands . . .	Cir. Miles	Weight, per mile	Weight, per foot	Elastic Limit, square inch . .	Ultimate tensile strength, sq. in.
Metals—						
Aluminum . . .	54	605,000	2940	...	13,000	26,000
Steel	7	78,500	1118	...	115,000	195,000
Total	61	683,500	4058	0.77		33,600

- Total resistance, 35 ohms per leg.
- Maximum working tension allowed, 13,000 lbs. per sq. in. in aluminum.
- Stringing tension at 80 deg. Fahr.
- Ice allowance 3130
- No ice allowance 4740
- Type of joints, McIntyre sleeve on steel inside of compression aluminum sleeve.
- Ground clearance:
- On right of way 25 ft. at 140 deg. Fahr.
- At crossings Legal, as required.

Ground Wires—

- Number per tower, 1.
- Size, ½ in., 7 strand.
- Material, Siemens-Martin steel.
- Breaking tension, 13,000 to 15,000 lbs.
- Maximum working tension allowed, 6500 lbs. sleet—2100 ft. span; 5000 lbs. no sleet.

Insulators—

- Number, 190,000; 38 per cent of which are on dead ends.
- Type, 2565-P Locke.
- Diameter, 10 in.
- Dry flash-over voltage, 590,000 suspension
- 720,000 anchor 9 disks suspension
- Wet flash-over voltage, 420,000 suspension 11 disks anchor
- 420,000 plus anchor

Routine Tests—

- First test per disk, electrical, flash-over voltage.
- Second test per disk, mechanical, flash-over voltage, 5000 lbs. after first electrical.
- Third test per disk, electrical, flash-over voltage 5 min. after mechanical.
- Ultimate tensile strength, 10,500 lbs.
- Maximum working tensile loading allowed, 4250 lbs.
- Eleven patrol stations are necessary, each requiring an equipment of tools and material weighing 10 tons.

NEW CAPISTRANO SUBSTATION

BY H. W. DENNIS

(In view of the fact that the interconnection of the vast system of the Southern California Edison Company with that of the San Diego Consolidated Gas & Electric Company's system involves the tying in of 50 cycle with 60 cycle high tension lines, this descriptive article by the construction engineer of the Southern California Edison Company is exceedingly interesting and timely.—The Editor.)

The new Capistrano substation of the Southern California Edison Company is located about one mile north of the old Capistrano Mission on the San Diego Boulevard. The building is of reinforced concrete, with metal sash, wire glass, and metal covered doors

The new substation will be tied to the Edison system by means of a 60,000 v. transmission line, approximately 30 miles long. This line will connect the substation directly with the present Katella substation, which is not far from the city of Santa Ana. This transmission line, at the present time, will consist of a single circuit of No. 2 stranded copper wire, carried on wooden poles; wooden cross-arms will be used throughout, except where the strain is excessive, at which points steel cross-arms will be installed. The line will be equipped with suspension insulators, made up of four standard 10-inch disks, excepting in the fog belts, where five disks will be used.

At the station the line will connect with an outdoor switching station, which will be made up of the necessary outdoor oil switches, lightning arresters, and transformers. The 60,000 v. 50 cycle line will be stepped down to 11,000 v. by means of two 6900 kva. 3-phase Westinghouse transformers. This 11,000 v. current will be carried to the substation in underground conduits. After passing through the frequency changer, the 60 cycle current at 6600 v. will be stepped up at the outdoor station to 70,000 v. by means of two 6200 kva. 3-phase, 60 cycle Westinghouse transformers. These transformers are shell type, oil insulated, water cooled and are equipped with 25 per cent starting taps for the frequency changer. The transformers will be mounted on rails which extend into the substation building; this will allow the transformers to be disassembled by means of a crane which will be installed in the frequency changer room. Both the incoming 60,000 v. 50 cycle line and the outgoing 70,000 v. 60 cycle line will be equipped with General Electric Company's aluminum cell lightning arresters.

The frequency changers, of which two will be installed at this time, are of the General Electric Company's make. The 50 cycle end is rated at 6750 kva., 11,000 v., 10 poles, 600 r. p. m.; the 60 cycle end is rated at 6250 kva., 6600 v., 12 poles. Each machine will have a 25 kw.-125 v. direct connected exciter, equipped with Tirrill regulators. A 15-ton hand operated crane will be installed for erecting the machines.

The system of metering the power will be very complete. Two watt-hour meters are to be connected to each machine. These meters are equipped with ratchets so that they can operate in opposite directions only, so as to measure either the power delivered to or received from San Diego. In addition to the watt-hour meters, there will also be installed a curve tracing watt meter with zero in the center of the chart. This will give a very complete record of the interchange of power in either direction.

DOUBLE OVERHUNG FRANCIS TURBINES

BY ARNOLD PFAU

(The use of large single units in hydro-electric development is connected up with the problems of high tension transmission lines, for to a great extent it has made these possible. The double overhung type of Francis turbine, a comparatively recent development, has already received important application in the West, as here pointed out by an electrical engineer who is an authority on hydro-electric machine design, being in charge of this department with the Allis-Chalmers Company.—The Editor.)

Single and double overhung impulse wheels have been used extensively for a number of years, and have proved to be simple, and mechanically correct in design. These hydro-electric units are of the two-bearing type, the rotor of the generator being located between the two bearings, and the impulse wheel placed overhung on one or on both extended ends of the generator shaft. The application of only two bearings to support the revolving weight simplifies the alignment and assures absolutely that each bearing receives its proper share of the total weight to be carried. The impact resulting from the jet produces a force which imposes a continuous bending strain upon the shaft within the adjacent bearing. However, there was no hesitancy in proceeding with the practical application of the overhung type of impulse wheel.

Strange to say, the single overhung Francis turbine is a design which was introduced into practice at a much later date than the overhung impulse wheel,

notwithstanding the fact that the Francis runner receives the water not only from one or two or three jets, but from a series of jets uniformly distributed over the whole entrance periphery of the runner. Thus the impact forces are practically balanced, so that the bending strain imposed upon the overhung shaft is reduced to that due to the relatively small weight of the runner itself.

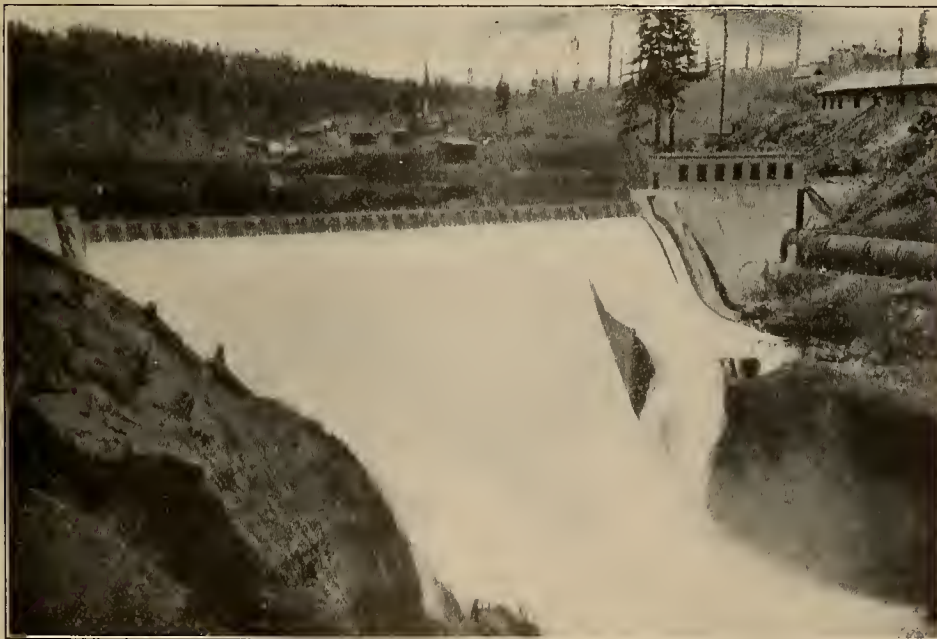
After the single overhung Francis turbine had proved to be an unqualified success it was only logical to take the next step and use two overhung Francis turbines for one generator.

The first two double overhung Francis turbine units were built in 1912 for the White Salmon Plant, Washington, of the Northwestern Electric Company of Portland, Oregon.

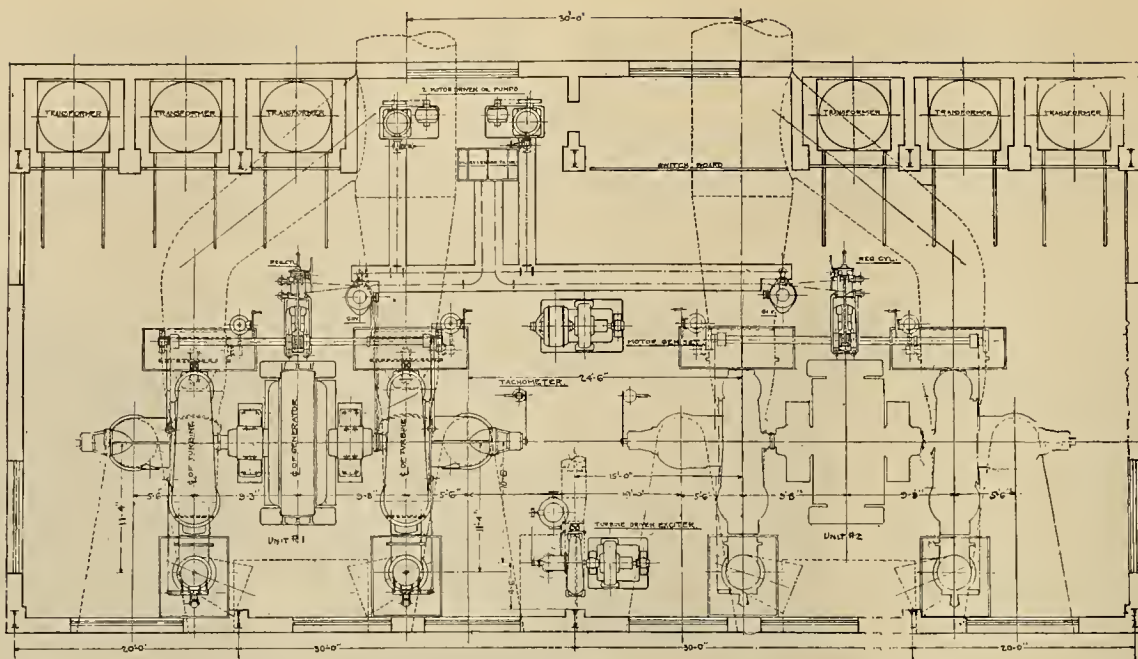
The units consist of two overhung Francis turbines of 4500 horsepower each, under a net head of 160 feet and operating at 360 revolutions per minute. The water is brought to



View of White Salmon River Powerhouse, showing penstocks and surge reservoir



Dam and gate house with 13½ ft. diameter penstock



Plan view of White Salmon River Powerhouse

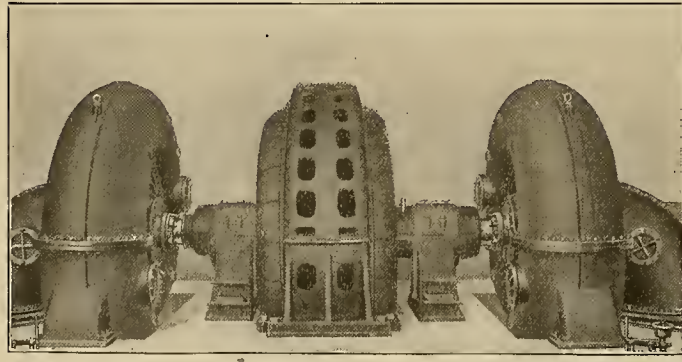
the plant by a wood stave pipeline of record diameter (13½ feet), ending in a large surge reservoir from which two penstocks, each 9 feet in diameter, lead to the power house. Here they are forked each into a pair of branch pipes of 6 feet 4 inches in diameter, reducing to 66 inches where they connect to the four butterfly valves by means of which

two governors receive the oil from a central oil pressure system with motor driven gear pumps in duplicate arrangement.

Each of the two turbines of one unit is so designed that it forms a self-contained prime mover. The butterfly valves enable shutting off the water so that one turbine may be entirely inoperative except that its runner revolves idly like a flywheel, without causing much resistance, however, because it can be properly ventilated.

The possibility of developing power in only one hydraulic side of the hydro-electric unit permits of increased water economy at less than half load. This is particularly desirable in cases where the flow of the river varies considerably and it can be readily appreciated that the two double overhung units at the White Salmon River Plant are very flexible, economical and efficient. The units embody practically four independent hydraulic prime movers, no turbine shafts are required and the power house space is smaller than that of any other type of turbine. They are especially efficient because the turbines can always be operated at a favorable gate opening, the discharge from each runner being led separately into the tail race and no heavy shaft obstructing the flow of the water in the quarter turn.

These units have been in continuous operation for five years and no replacements have been necessary, and none of importance will be necessary for a num-



Front view of Halsey installation, showing bearings for generator unit

the water can be shut off individually from each of the four spiral casings. The runners are placed overhung on the extended generator shafts and a small stub shaft alone projects through the quarter turn to the mechanical thrust bearing. This shaft does not participate in carrying the weight of the runner.

For each unit an oil pressure governor is used for the control of the wicket gate of the two turbines. The

Map of White Salmon River Plant Development



INTERCONNECTION AND NEW POWER DEVELOPMENT

BY P. M. DOWNING

(Interconnection and the demand for new power developments are matters of prime interest in these days of fuel shortage. Here is an article on this subject by the chief engineer of the hydro-electric department of the Pacific Gas & Electric Company, who has been made operating manager of the vast systems of interconnection of the great power companies of north central California, which comprise the greatest combined area in the world served by an interconnected system of electrical energy. The article is abstracted from a recent paper presented before the San Francisco Section of the American Institute of Electrical Engineers.—The Editor.)

It is a matter of common knowledge that there is a very serious power shortage in California, particularly in the central part. The business of the different power companies has made a wonderful growth in the last few years, but the construction of new facilities to meet the increased demands for service has not kept pace with the growth of the business. Some idea of this increase may be had when I say that in 1900 the installed hydro-electric capacity in the territory north of Merced, that is, the territory north of that supplied by the San Joaquin Light & Power Company, was, approximately, 15,000 hp. By 1917 this had increased to 375,000 hp., an increase in the seventeen years of 360,000 hp. In addition to this 375,000 hp. of hydro capacity, there is now installed 187,000 hp. in steam plants.

Although there is an abundance of undeveloped hydro power well within distances that it could be economically transmitted to the Bay Counties, it has been allowed to lie idle for no other reason than that capital could not be interested in its development. These projects are unattractive not because of physical or engineering reasons, but solely because their development and utilization are unattractive financially; in other words, they are not looked upon as good investments. Capital can be otherwise invested where it will be more secure, and where it will yield a better return. Before an investor is asked to put his money into any enterprise, he must first be assured that the investment is a reasonably safe one. He must know that there are equities back of the project that will secure him against loss. He must also know that the enterprise is one with an earning capacity that will insure him a fair return on his investment, and at the same time leave a reasonable surplus to properly maintain the property. Public utility securities, unfortunately, have not always afforded all of these inducements, with the result that money has not always been available when it became necessary to provide new facilities for carrying increased loads.

This condition has been brought about, first by the refusal of rate regulating bodies to establish rates that would yield the utilities a return on their investments comparable with the returns on capital invested in other unregulated enterprises, and secondly by the attitude of the Federal Government in the matter of refusing to grant to power companies anything more than temporary permits for the occupancy of public lands. The radical ideas and rulings of the conservationists have for years been a stumbling block in the way of hydro-electric development. Under existing regulations of the Department of the Interior, no one can enter upon any public land within the Forest Reserve for the purpose of constructing any part of a hydro-electric development, except by signing a revocable permit terminable at the discretion of the Secretary

of the Interior. Not only are these permits subject to this and other objectionable conditions that might be imposed when they are granted, but they are also subject to such other conditions as the Department might subsequently impose even after the investment has been made. From the standpoint of the investor, a very objectionable feature of these permits is that the applicant must agree to turn over the entire property to any municipal, state or federal body at any time upon receiving payment therefor, a price to be finally determined by the Secretary of the Interior; in other words, the investor at the discretion of the Secretary of the Interior must give up his property at any time without having any voice in determining the price at which it is to be taken.

It is immaterial how much, or how little of the completed project may lie within the public domain, there is absolutely no way to acquire a fee to the property occupied, and the only possible way to secure even the temporary easement is by signing the permit which would involve the entire project.

As a very large part of the undeveloped water power resources in this state are so situated that at least some portion of almost every development would fall within the Forest Reserve, it will at once be apparent how far reaching a requirement of this kind would be.

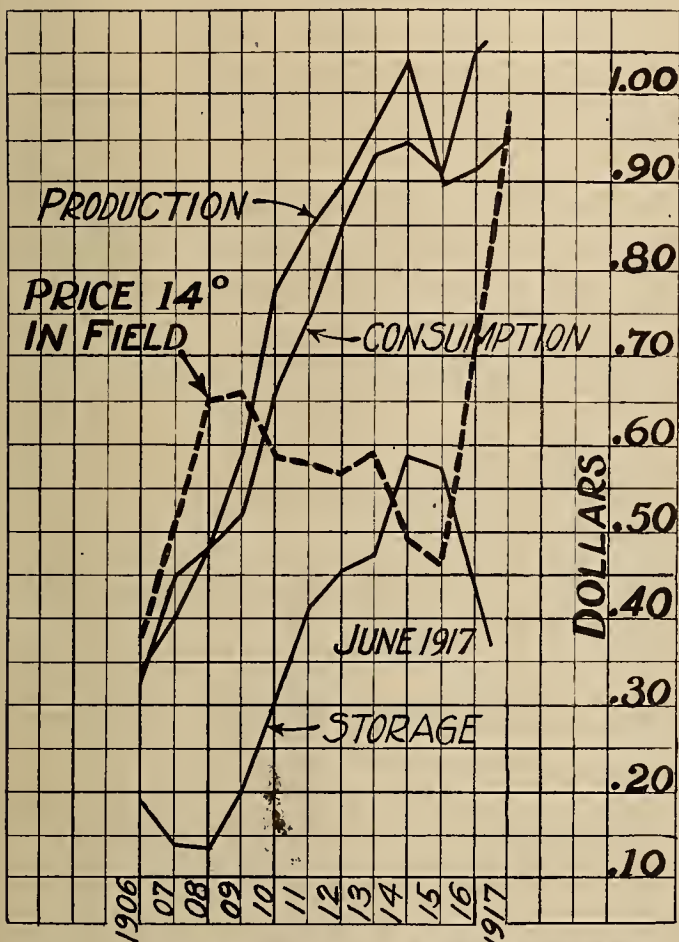
A recent report made by a special committee of the Chamber of Commerce of the United States appointed for the purpose of reporting on water development as affected by the policy of the federal government contains, among other statements, the following:

One of the first things to be clearly perceived, for an understanding of this subject, is that water-power developments are not exceedingly profitable undertakings earnestly sought by capital as a means of securing large returns on a small investment; but that, on the contrary, steam power is the superior to water power in almost all respects. In order to procure the adequate development of water power, inducements must be offered.

There is a very general, but entirely erroneous, belief that any water power running to waste can be utilized at small expense. The initial cost of a steam plant is in general but one-half to one-fifth that of a water-power plant of equal capacity. Moreover, because a steam plant can be more easily enlarged from time to time, the initial development of a water-power plant must, in general, be a much larger proportion of the ultimate contemplated development than in the case of a steam plant. It follows that the investor in a water-power plant is burdened from the very start with a heavy fixed charge, the failure to meet which may mean bankruptcy. The risks to capital in water-power developments are, therefore, much greater than the risks in the case of steam power. The advantage of water power lies in its smaller expense of maintenance, due to the smaller amount of labor and the absence of any cost for fuel.

Water powers will not be developed unless the conditions are made comparatively favorable. Present demand for the development of such power comes, not from capitalists, but from communities which, on account of the high price and scarcity of fuel, are desirous, in their own interest, of inducing capital to make such developments.

In order to secure the adequate development of water power, it is essential that the subject should be approached with an attitude of mind which recognizes the necessity of making such developments attractive to capital, rather than with that attitude which assumes that such enterprises should be surrounded with as many restrictions as possible.



PRODUCTION, CONSUMPTION AND STORAGE OF FUEL OIL. In order to read in millions of barrels, multiply the vertical column headed "dollars" by 100, thus the production of 1912 was 90 million barrels.

This short-sighted policy on the part of the federal government has retarded hydro-electric developments and forced the companies to take care of their increased load with steam generated energy.

With oil as cheap as it was prior to 1916, the modern steam turbine, with its high efficiency, its low first cost and the guaranty of the investment, gave promise of being a real competitor of the hydro installation. However, during the past two years, the production of oil has decreased and the consumption increased, thus necessitating a very heavy draft from storage. As a result, the approximately 35,000,000 barrels of oil in storage in 1916 is being depleted at the rate of, approximately, 1,000,000 barrels per month. If the present ratio of production to consumption continues, the entire storage will be exhausted by 1920.

In view of the government's activities in building up a merchant marine, and the general industrial ac-

tivity throughout the entire country, there is but little doubt but what even with the increased activity in developing new wells, this shortage will continue. The prevailing high price of oil will be an incentive for greater production by the development of new properties.

The active producing period during which the oil wells of this state can be economically operated, is probably not to exceed twenty to twenty-five years. Records of the decline in production of wells in the various fields show that during the first five years of the well's life, the production drops off, approximately, 75 per cent. As the number of wells in the different district increases, it is reasonable to say that this rate of decline will also increase. With these facts before us it would appear that the added supply to meet the increased demands would have to come almost entirely from new wells rather than from those now being operated.

The sources of the world's oil supply amounting in 1915 to 427,695,347 barrels, shows that a very large proportion of the total is produced in the United States. During that year the production in this country amounted to 281,104,104 barrels, or 65.72 per cent of the total. Russia came next with 68,548,062 barrels, or 16.03 per cent of the total. Of the total United States production amounting to 281,104,104 barrels, the California fields produced 89,566,779 barrels, or, approximately, 32 per cent of the total. Only one other field, viz: the Kansas and Oklahoma, produced more than this state. Here the output was 121,920,000 barrels, or 43 per cent of the total.

The largest individual users of fuel oil are the railroads, their consumption being, approximately, 40 per cent of the total. Steamships come next with, approximately, 13 per cent of the total, and public utilities third with 10.8 per cent.

The success attending the operation of railroads that have been electrified during the past few years, demonstrates beyond a doubt that the problem of changing over from steam to electric operation is one of economics rather than engineering. With oil as the only fuel that is economically available in this state, and the price of this commodity continually increasing, there is every reason to expect that before many years many roads now operating by steam will be changed over to operate electrically, receiving their power from hydro-electric sources.

With steamships the situation is an entirely different one. Here the motive power must be had from fuel in some form or other. Oil occupies less space, is more easily handled, and is a better fuel in every respect than coal. With a larger merchant marine, the demand for oil for shipping purposes will be materially increased, and in view of the encouragement and support now being given by the federal government to this industry, it is safe to say that every possible effort will be made to encourage the industry by the conservation of oil for this purpose.

Public utilities use oil for two purposes, the first and larger usage being for the manufacture of gas, the other for the operation of steam driven electric stations. For the manufacture of gas there is no economical substitute for oil. Coal could be used were it

ACTUAL PAST LOADS AND ESTIMATED FUTURE LOADS

(Comprising the Following Companies: Pacific Gas & Electric Company, Great Western Power Company, Sierra and San Francisco Power Company, Northern California Power Company, Cons. Western States Gas & Electric Company, Stockton System.)
Expressed in Millions of Kilowatt Hours

Year—	Total Load	Hydro Used	Estimated Hydro Available	Steam Used	Estimated Steam	Per Cent of Steam to Total	Oil required for Steam in Barrels..	Peak in k. w.	Present peak capacity of steam and hydro during draft on storage in k. w.	Deficit of Peak Capacity in k. w.
1915	1,223	915	.....	218	...	17.8	1,090,000	216,000	.....	.....
1916	1,357	1,151	.....	206	...	15.2	1,030,000	239,000	.....	.....
1917	1,507	1,268	.....	239	...	15.8	1,195,000	265,000	.....	.....
1918	1,665	.....	1,380	.....	285	17.1	1,425,000	294,000	338,000	.....
1919	1,850	.....	1,380	.....	470	25.4	2,350,000	327,000	338,000	.....
1920	2,050	.....	1,380	.....	670	32.6	3,350,000	362,000	338,000	24,000
1921	2,280	.....	1,280	...	900	39.5	4,500,000	403,000	338,000	65,000

NOTE:—The above figure assumes operation of all plants at 100% of their plant capacity.

available in sufficient quantities, and at the right price, but at the prices that have always prevailed in this state, gas could not be produced and sold at a rate that would permit of its being used as generally as it is today. Steam generated electric power can be supplemented by hydro generated. It was to accomplish this purpose and to conserve all oil by the utilization of all of the available hydro energy of the different power companies in so far as it was possible to do so, that the present power interchange arrangement was entered into between the companies operating in this vicinity.

Due to abnormal climatic conditions no large quantity of oil has thus far been saved by the interconnection. With an unusually dry season lasting from April, 1917, to February, 1918, the stream flows throughout the entire state are much below normal, and none of the hydro plants have been able to operate at anything like their normal capacities. The precipitation to date for the winter of 1917-18 is not more than 50 per cent of normal, and unless we have unusually late storms during the coming spring, a very serious shortage of hydro-electric power may be expected before the flood water season of 1918-19. This shortage of hydro power will have to be made up from the steam plants. Not only will these steam stations have to carry the added load thrown upon them by an unprecedented water situation, but will also be called upon to carry the normal increase in load amounting to between 10 and 11 per cent.

No new hydro plants are under construction at this time to relieve the situation and reduce the oil consumption. Under present financial conditions there is but little probability of anything being done in the way of making developments, but even if money, material and labor were all available immediately, it would require two years to complete any installation large enough to be much of a factor in accomplishing the desired results.

The combined loads, actual and estimated, with sources of energy supply, oil required, combined peak loads and peak capacities, of the five larger systems operating in the north central part of the state, viz.: Pacific Gas & Electric Co., Great Western Power Co., Sierra and San Francisco Power Co., Northern California Power Co., Cons., and Western States Gas & Electric Co., are given in the following tabulation. The figures showing the estimated hydro available for 1918 to 1921, inclusive, do not contemplate any

additional energy from new plants, but do contemplate normal water conditions with a very decided shortage. Thus far during this year there is every reason to expect the hydro output to fall short a considerable amount and the steam production to increase correspondingly. However, a more serious situation will obtain in 1920, unless additional generating facilities are provided. By this time the combined peak load will have increased to 362,000 kw., with an available peak capacity of 338,000 kw., or a shortage of peak capacity of 24,000 kw.

With the situation such as the foregoing figures indicate it to be, it will at once be apparent that something should be done immediately in the way of developing additional facilities not only to conserve fuel oil, but more especially to meet the increased demands of service.

SOME REASONS WHY POWER DEVELOPMENT HAS CEASED

BY JOHN A. BRITTON

(Here are forceful reasons why hydro-electric power development has ceased upon the public domain. The author, who is vice-president and general manager of the Pacific Gas & Electric Company, is now in conference with governmental authorities at Washington. Recent utterances of President Wilson indicate that the hampering regulations that have prevailed hitherto will soon be removed in order that utility growth and operation in the West may be maintained at its highest efficiency.—The Editor.)

The hydro-electric installations in the North-Central part of California have increased from a total of in 1900 of approximately 15,000 horsepower to a total today of upwards of 375,000 horsepower, with installations in addition of steam of 187,500 horsepower.

The necessity for the conservation of water and additional development of power brought the power companies into contact with the United States Government in relation to the occupancy of public lands, due to the extension of forest reserve boundaries and power-site withdrawals, and immediately the departments of the Government having charge of such lands instituted rules and regulations governing such occupancy which made burdensome the utilization of government lands for the purpose of developing the ultimate power of this State. These rules and regulations have been a constant source of contention and have been brought into courts in numerous cases by the power developers on the ground that the Department of the Interior and the Department of Agriculture in

their control over public lands, and lands within the forest reserve, were exceeding the power and authority granted by Acts of Congress.

The most noted case that brought to an issue many of the questions involved was that of the Beaver River Power Company against the United States, recently decided by the Supreme Court of the United States on an appeal to the District Court for the District of Utah. Unfortunately the decision did not touch upon the most vital question of the right of the departments to make rules and regulations in contravention of the laws of Congress—the case being decided upon other issues.

I quote from an address delivered by John Martin, noted pioneer in water-power development, delivered before the Pacific Coast Gas Association in September, 1909. He says:

"The National Government, through its Forestry Department, is placing various restrictions upon the appropriation and use of water within the reservations.

"The only control which the National Government can exercise upon the waters within the State of California is due to its rights of ownership to land upon which or over which the water travels in its downward course to the ocean, and by placing the restrictions and imposing financial burdens upon the proposed use of said water, the Government is thereby increasing the cost of power purchased and placing the development of said water at a serious financial disadvantage in competition with other plants which are already installed and in operation.

"All water rights in California (except on public lands) are state property, and laws have been established for their appropriation and use, over which the National Government has no control."

This statement is true today.

The permits granted by the Department of Agriculture, having control of the Forest Reserve lands, are revocable at will and of such a character as to prevent, as they have prevented, the proper development of power projects in this State. I will quote you from Article 28 of a permit, which is a sample of those required to be taken out by applicants for the use of government land.

"That upon demand therefor in writing from the Secretary, the permittee will surrender the permit to the United States or transfer the same to such state or municipal corporation as the Secretary may designate, and on the conditions specified in this article will give, grant, bargain, sell or transfer with the permit (upon such demand and upon said conditions) the power project as defined. Such surrender or transfer shall be upon condition precedent that the United States or such transferee shall pay to the permittee the reasonable value of all of such works, etc. Such reasonable value shall be determined by mutual agreement between the parties in interest, and in case they cannot agree, by a body of arbitration of three members."

No provision, you will note, is therein made for an appeal to the courts to determine the value of the property, nor does it provide any values for initiative or risks.

Throughout the permit it provides for its revocation for causes which may be determined by the Secre-

tary. It imposes a tax burdensome in its nature, not only for construction purposes but still more burdensome for operative purposes; and, further and most vital of all, it does not provide for any severance value where the power project is separate from a distribution system.

It must be clearly evident from a casual reading of these provisions why capital has been shy in investing in projects that might, overnight, be deprived of their value.

As illustrating the control that the Federal Government has over the water power possibilities of our State, a control obtained by extension of forest reserve boundaries and by power-site withdrawals, it is a fact that of the maximum potential water horsepower that may be developed, the Government controls 94.3 per cent of the lands necessary for the perfect development of power projects, and of the total of said maximum potential water power, but 4.3 per cent has been up to the present time developed, while in the original states, or states not classed as public land states, the percentage of development averages approximately 30 per cent. This is merely illustrative of the restrictive power, by reason of governmental regulations, upon developments within public-land states.

Within the realm of power assumed by the departments, and for which it is respectively submitted there is no color in law as yet sustained by the Supreme Court of the United States, the departments assume that in the minor occupancy of governmental lands rules and regulations governing the whole project or its absorption by the Government at its pleasure will prevail.

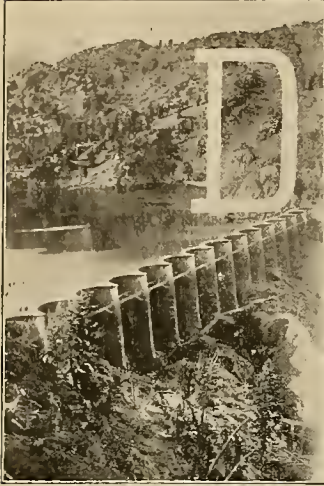
There is a power project in this State having a potential possibility of 200,000 horsepower, which has been built so far as its reservoirs, flumes, forebays, pipe lines and powerhouses are concerned, entirely upon land, aggregating 12,578 acres, owned in fee by the power company, with the single exception of 38.7 acres of land overflowed by one of the reservoirs. These thirty-eight acres have been placed in the forest reservation. It is land barren and bare of any vegetation; granite rocks rising above other granite rocks, upon which vegetation would be impossible, and yet because the flooding of this meager acreage by the backing up of the water from the dam impinges upon the alleged Forest Reserve, the Government demands that all parts of the project shall come under the control and domination of the Government and shall be subject to the provisions and permits heretofore quoted.

In another instance there is a power project having a potential possibility of 250,000 horsepower, in which less than two per cent of the entire land devoted to the project is upon Government reservation. The project could be developed (but the power would be lessened some ten per cent) by moving down the stream a few feet, and the project would then be entirely without the forest reservation. Patriotic duty would seem to impose upon the promoters of this project the utilization of the water to the fullest extent possible, yet these conditions of patriotic submissal would result in cost charges and obligations that would render it impossible to finance the project under the conditions imposed by present rules and regulations of departments.

ADVANCES IN MULTIPLE ARCH DESIGN

BY L. R. JORGENSEN

(In view of the wide interest throughout electrical circles in the West attaching to the storage of water for the great hydro-electric developments of this region, it is important for our readers to be familiar with the various types of dams in use and their technical details. The multiple arch dam, its possibilities and limitations and the principles of its design, will be discussed in this and succeeding issues by a well-known authority on this type of dam design.—The Editor.)



Gem Lake Dam, showing general plan and type of foundations

URING the last few years several multiple arch dams have been built in various parts of the country, and they have so far been very successful in operation. Many more would undoubtedly have been constructed had a thorough knowledge of their design and construction been more general among dam building engineers. There are places where rock or earthfill dams, or a combination of the two, are now built, where multiple arch dams could

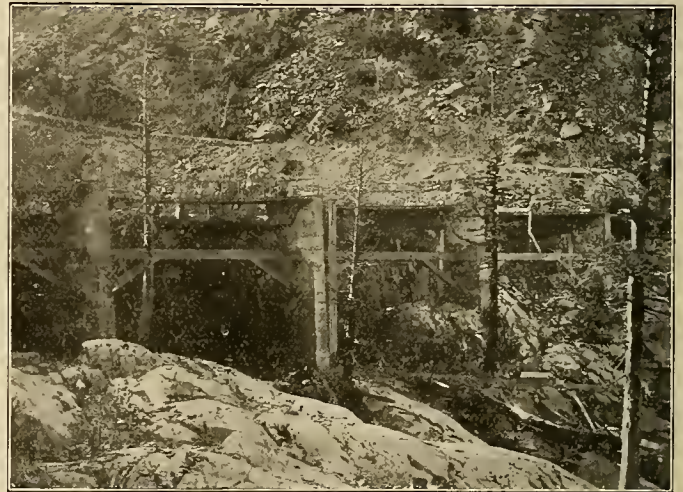
have been constructed more cheaply and more substantially.

While a rock or earthfill dam can, under ordinary conditions, be constructed with a sufficient although unknown factor of safety, such dams are absolutely unsafe under abnormal conditions, such as when water accidentally passes over their crest. It is a well-known fact that nearly all failures in the past have been due to this cause. Water passing over the crest of a multiple arch dam would not destroy the dam, and, for a more or less limited time would not hurt the foundation if this was otherwise at all safe for such a structure. A multiple arch dam requires a good foundation, as the load is concentrated on buttresses and settlement of these would be liable to cause the collapse of adjoining arches. Whenever the foundation is solid rock, however, a multiple arch dam can be constructed, as substantial as any type of dam and more substantial than most types. The stresses and dimensions can be calculated with a large degree of accuracy. The factor of safety of such a structure is therefore known within narrow limits, assuming first-class construction work, and precedence should, on that account, not be given so much consideration as with rock and earthfill dams. These latter cannot be subjected to calculations of stresses, and therefore have to be built mostly along lines dictated by precedence. In general, it can be said that a multiple arch dam of small and medium height (not less than 100 feet high) will cost less to construct than a rockfill dam, and especially a rockfill provided with something better than a wooden upstream face for the watertight cut-off. Only perhaps in rare cases would there be occasion for comparing the relative cost of a multiple arch dam and the cost of a strictly earthfill dam, because if there is enough suitable earth to construct an

earth dam, a sufficient good foundation for a multiple arch dam and sufficient good building material for the same is not likely to be found at the same place, and vice versa.

For multiple arch dams above, say 130 feet high, the amount of building material required, and therefore the cost of such a structure, increases quite rapidly, due mainly to the fact that the buttresses become very large and require more bracing. A limit of height is, therefore, eventually reached where it will be more economical to build one single arch across the canyon, unless the canyon be very wide. Where this limit of height for any dam lies can only be found by trying all the types possible of application, as the shape of the dam site has also quite an influence in the matter.

The first thing to be determined in the designing of a multiple arch dam is the length of each individual span. Unless there should be strong reasons for using different span lengths for the several arches making



Downstream face of Agnew Lake Dam, showing spillway openings

up the complete structure, all spans should be made the same to facilitate the form work. Theoretically, the shorter the spans are chosen, the less material is required for the arches. The material required for the buttresses remains theoretically the same, no matter what length of span is chosen. While a dam consisting of small spans takes less material than one where larger spans are used, it may not necessarily be cheaper to construct. The form work becomes more extensive and it is more difficult to place the concrete and reinforcing steel in the resulting narrow space between the form boards than in a wider space. Thin arch walls are more liable to collapse than thicker walls, and thin buttresses would require elaborate bracing to prevent their collapse before anywhere near crushing strength had been reached. It is the arch

that holds the water back, and therefore the watertightness of the dam is to some extent a function of the thickness of this wall, although to a much smaller extent it depends upon the quality of the building material (concrete) used.

Taking all these facts into consideration, it can be said that the practical, most economical span, lies somewhere between the limits of 30 feet and 50 feet. For high dams the economical span is near the upper limit, and for low dams, near the lower limit. A 40 foot span would be a good average value for ordinary cases, and is chosen in the present instance.

Next to be determined is the length of the upstream radius. It is known that the most economical arch* is the one that subtends an angle of $133\frac{1}{2}$ degrees, and that for variations of about 10 per cent on either side of this angle, the difference in economy is very small. For the dams to be described later the subtended central angle at the upstream face has been chosen 120 degrees, or to be exact, 119 degrees 57 minutes. The volume of the arch has thereby been increased approximately 1 per cent above the theoretical minimum, but the thickness has, at the same time, been increased 6 per cent, thereby decreasing the ratio of thickness of arch to length of arch, which is a desirable feature for structural reasons, at least towards the crest where the thickness is small compared with the length. This also decreases the tendency of percolation by decreasing the area of the wetted surface, and by increasing the thickness of the wall.

With the subtended angle (120 degrees) and the span (40 feet) decided upon, the length of the upstream radius is calculated to be 23.1 feet. To facilitate form work the length of this radius is kept constant from crest to foundation, except as noted later. Incidentally this gives also the most economical arch as the subtended angle is thereby kept practically constant. The arch is given a slope with the horizontal of 50 degrees, in order that the water pressure, acting upon the vertical projection of this slope, may tend to cut down the shearing stress on the buttresses to zero or to some insignificant value.

The arch carries the total waterload, and a large part of the load due to its own weight. A preliminary arch thickness may be found by means of the simple formula $P \times Ru = qxt$ — (1) in which P equals the water pressure in pounds per square inch, Ru equals the length of the upstream radius in feet, q equals the average stress in pounds per square foot of the area of the dam section under consideration, and t equals the thickness of the dam at any given horizontal elevation.

After the thickness has been determined, at as many points as thought necessary, say at every 10 feet apart in elevation, the weight of the arch can be calculated and the additional arch stress due to this load determined. If the total stress is found to be excessive, a new thickness will have to be decided upon.

WAR TIME PUBLIC UTILITY PROBLEMS

BY MAX THELEN

(Here is a terse statement of some of the war-time activities of the California Railroad Commission which should prove intensely interesting in these days of power shortage and world emergency. The author is president of the Commission. The matter set forth is an abstract of a notable address delivered recently before the extension division of the University of California in a course on Public Utilities.—The Editor.)

Recently, after conferences between Pacific Gas & Electric Company, Great Western Power Company, the Federal Fuel Administration, the Federal Forest Service and the Railroad Commission, all parties agreed that the combination of the so-called Feather River No. 5 project of Great Western Power Company with the so-called Yellow Creek project of the Pacific Gas & Electric Company affords a possibility of developing additional hydro-electric power in the shortest time at the least expense and in the greatest amount of any large power developments now available in California. The two electric companies have written a letter to the Federal Fuel Administration and to the Railroad Commission, stating that they realize the impossibility of present and near future development by the use of their own credit, and that in their judgment it will be necessary for the Federal Government to give financial assistance in the proposed development. The companies have agreed that if the Federal Government will consider financing this development, they will use every effort to meet the Government's requirements. It is estimated that at least 25,000 kilowatts of electric energy can be made available in one year's time, that the ultimate development will be approximately 220,000 kilowatts and that the cost for the complete project will be at least \$25,000,000.

If the War Finance Corporation bill passes, the Federal Fuel Administration and the Railroad Commission will promptly present this development to the federal authorities and will seek their aid in its execution.

In the situation which now confronts many of our public utilities, the duty of the state commissions is clear. While providing for the continuation of adequate service, it is their duty to act promptly and vigorously on applications for increased rates based on increased operating costs.

Where the usual methods of rate making would result in unusual delays, short cuts must be applied to meet the emergency conditions.

Our public utilities must be kept in a sound and healthy financial condition, so that they will be able to meet not merely the requirements of their existing patrons, but also the additional requirements of the war. The state commissions should not wait until the utilities come to them with their pleas for assistance. It is their duty to inform themselves by their own investigations, if necessary, concerning the condition of the public utilities under their jurisdiction, and to keep themselves constantly informed.

If the state commissions rise to meet the situation, as they are doing in all sections of the country, they will be rendering a substantial service not merely to the utilities and their patrons, but also to the nation itself which is largely dependent for war efficiency on the service of public utilities.

*For further information see page 34, Journal of Electricity for January 15, 1917.

A FUTURE LOAD FOR THE CENTRAL STATION

BY JOSEPH P. COLLOPY

(The success which has attended experiments in the stimulating of plant growth by electricity points to the possibility of this practice becoming profitable commercially. As yet no apparatus has been put upon the market in this country, and the field seems an enticing one to the electrical experimenter. The author of this interesting review of the present situation is familiar with Western conditions and writes from knowledge of actual experiments. He is with the engineering staff of the Commonwealth Edison Company.—The Editor.)

At the present time electric current is used in a number of operations about the farm and does the work more economically and satisfactorily than any other power. These operations are varied, consisting chiefly in grinding feed, pumping water for stock and irrigation purposes; running the cream separator and a number of other small chores. In a great many cases this makes a very desirable load for the central station. There is another use for electricity on the farm that promises to be far more important than any of the above mentioned. This is the electrical stimulation of growing plants, or, as it is now commonly called, "electroculture of plants."

The stimulation of plants by means of electricity is by no means a new idea. The credit for the first experiments along this line has been given to Dr. Mainbray of Edinburgh as far back as the year 1746. The experiments were performed on potted plants and a static machine was used to produce the stimulating current. The experiments were varied, but the general scheme was to suspend one terminal above the plant and ground the other. The current was applied for varied lengths of time. These experiments were reported successful. Nearly all the later experimenters using high voltage applied the same scheme. Nollet, a French physicist, took up the subject in the same year. He claimed that electricity increased the evaporation of water and that this was the cause of the increased growth. He reported his experiments as giving very favorable results. Jallabert performed the same experiments as Nollet a few months later with the same results. De Lacepede, in 1779, found the growth and germination of garden vegetables noticeably better. Marat in 1782 performed the same experiments as De Lacepede, only with different plants, and reported favorable results. Bertholm performed a number of experiments along this line and was very well pleased with the results. He was, it seems, the first one to attempt the application of electroculture in a commercial way. Bertholm was also the first one to recommend it as a panacea for plant diseases caused by insects and fungi. About this time De Roziere performed extensive experiments on wheat, rye, peas, radishes and other garden vegetables. He said the experiments were favorable in every way. The plants grew faster, larger, had longer roots, and were free from fungi.

Gardiu of Twin did not find things as favorable as his fellow experimenters. He stretched two wires over his garden and connected them to a terminal of a large static machine, the other terminal being grounded. He reported that the garden began to fail in much the same manner as it would if subjected to a large amount of heat. A man by the name of Ingenhouz planted some seeds in Leyden jars. He also reported negative

results. No data concerning current strength, voltage, or water supplied were recorded.

From the year 1800 to 1843 very little experimenting was done. In the year 1844 the problem was again attacked with renewed interest. During this year a number of experiments were performed in some comparatively large plots of barley. High potential wires were stretched over the grain with one side grounded. These experiments were reported favorable enough for commercial use. About this time galvanic electricity was used for the first time. These experiments were performed by burying zinc and copper plates containing about 25 square feet at different distances apart and connected together with a wire insulated from the ground. Some of the best results were obtained with the plates about 200 feet apart. One experimenter used this scheme with potatoes and was favorably impressed. Other experimenters tried this scheme but called it a failure. No record as to the current or voltage obtained were left. A good many other experiments with plates were performed using different impressed voltages, both alternating and direct current. The reports of these experiments contradicted each other in such a way that no conclusion can be drawn from them.

During the last few years a number of experimenters have used both direct and alternating current, mostly at high voltages. One of the latest experimenters performed over 50,000 experiments on as many different potted plants. G. E. Stone has performed a number of experiments on plants in large boxes. The thing that distinguishes his experiments from others is that he measured the current that was used in each case. The current at which he found best results varied between 0.05 and 0.55 milliamperes, although he conducted experiments with currents as high as 1.0 milliampere. He found that the current produced by burying plates in the soil varied greatly with the nature of the soil. Plates 5 feet by 3 feet, 4 feet apart, generally produced a current ranging from 0.02 to 1.0 milliampere, but sometimes reached many times this. He was more impressed with the high tension experiments than with the galvanic ones.

The results obtained from electroculture as applied the last two or three years have been very successful in greenhouses and small gardens. The increase in yield has amounted to as much as 50 per cent for carrots, 17 per cent for cucumbers, 80 per cent for year-old strawberries. Melons have done wonderfully well. In one garden near Chicago that the writer visited, 362 muskmelons, much sweeter and larger than the average melons, were raised on a plot of ground 20 feet square. Sugar beets grow to be a third larger and the sugar content is about doubled. All experi-

menters, without exception, agree upon the benefit to the sugar beet.

A very important factor in favor of electroculture is that the plants under treatment have always been free from disease and fungi. If this simple treatment would prevent rust and smut in grain or the dreaded potato blight it would certainly be worth while without any additional yield.

The reason for increased growth and vigor of plants under the influence of an electric current is a much disputed subject. Some of the earlier experimenters laid it to the fact that electrical stimulation increases the capillary action of the plants; that is, more water was drawn up into the plant, in this way increasing their growth.

To prove that atmospheric electricity has an effect upon plants, experimenters have placed screens over plants and grounded the screen. It is said that the growth of the plants is greatly retarded. In some of our northern countries, although their seasons are much shorter than ours and the temperature quite low, plants grow to full maturity well within the season. Some have claimed that this is due to the fact that they are in the close vicinity of the Northern Lights.

When everything is considered, the field looks promising, but there is a great deal to be done before a definite system is decided upon. Up to date experiments have been tried only upon small beds of plants and not upon a large scale. A method of suspending the wires to permit cultivation has not been perfected. No voltage or frequency has been accepted as standard. The amount of current that can be beneficially applied, or the best time of application, has not been decided. These and many other phases are to be worked out, but on the face it seems but a matter of time.

The amount of power required is not large; three kilowatts being enough for twenty acres, and this to be applied only for a few hours each day. Considering the increased yield, the superior quality of the product and the early maturity, this amount should not prove prohibitive. Gardeners who have seen electroculture tried out are very enthusiastic and are ready to adopt it as a commercial proposition. It seems that the agriculturist is ready to carry his end, but the engineer has not developed the apparatus for his use. Of late a commercial machine has been developed by an English firm, but it seems that none have yet appeared on our American market.

ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

Beasley v. Engstrom, 168 Pac. 1145

The plaintiff in this case commenced the action to recover damages and to secure an injunction to prevent the defendant, an upper one, from allowing excess water from his irrigated land to drain through a natural hollow on the land of plaintiff. The Supreme Court of Idaho held that the defendant had a clear prescriptive right to continue using the hollow for a drain.

The plaintiff claimed that the defendant diverted for irrigation use an excessive amount of water, and that if he restricted himself to a reasonable use of water there would be no drainage waters to cause the alleged damage. The court held that an irrigator "has

a right to divert sufficient water to properly irrigate his land, and the fact that, because of its slope, it requires more than does land which is more nearly level cannot defeat his right."

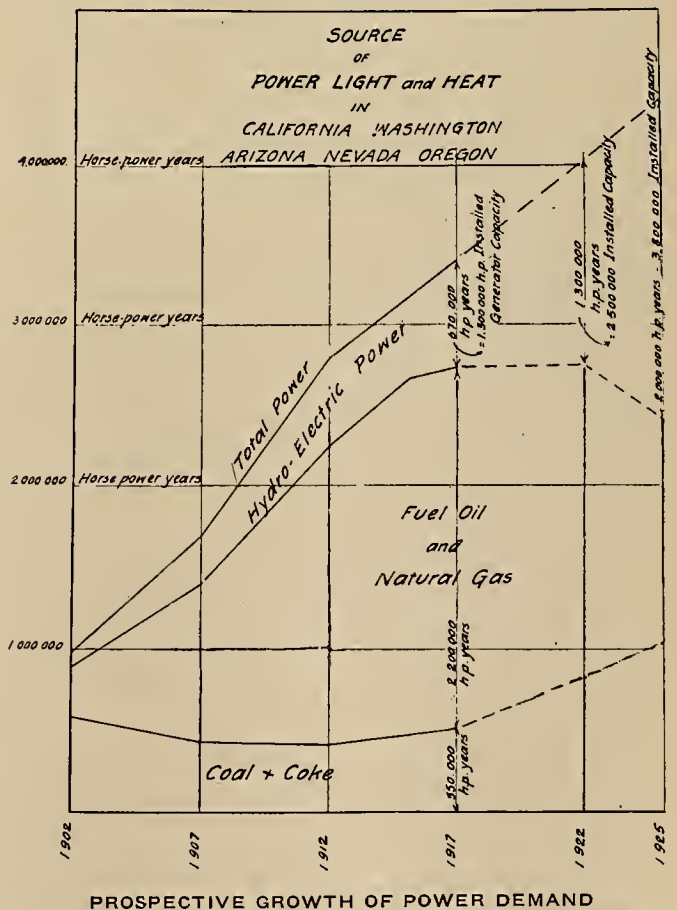
The case is of importance because the Idaho Supreme Court emphasizes the point that what constitutes a reasonable use depends upon the circumstances of each case, and that the method commonly used in the vicinity has a bearing in determining the amount of water to which a user is entitled.

Fearnley v. Haines, 168 Pac. 1176

Until comparatively recently, it was uniformly held that where one built a ditch across the property of another with the unwritten permission of the other, such right of way was revocable. A number of western states now, however, hold that where one has been allowed to construct a ditch, the right becomes irrevocable. In the Fearnley case the Supreme Court of Colorado, in reversing the lower court, upholds this new rule in the following words:

"We have announced the rule many times governing this subject, and it seems unnecessary at this time to more than reiterate the doctrine:

"That where a ditch owner is permitted without interference to construct a ditch over the land of another, and the ditch is put in use, a right of way is thereby acquired, and the necessity for condemning to obtain possession is obviated." Rogers v. Lower Creek Ditch Co., 62 Colo. —. 165 Pac. 248.



Here is how Gaskell S. Jacobs, a member of the engineering staff of the California Railroad Commission, estimates that in the year 1925 some 3,800,000 hp. installed capacity in hydro-electric power will become necessary to meet the growing demands for power in the West.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The taking of test data for economy study in steam electric plants is greatly facilitated by the use of properly designed log sheets. In this article the authors set forth suggestions for keeping tab on the water fed to the boiler, and the oil to the furnace, together with a general log sheet for the complete test. An illustration is also given for the construction of a graphic log sheet that has proved helpful in fuel oil practice. These suggestions are being embodied in a book on the elements of fuel oil and steam engineering—a work of over three hundred pages, profusely illustrated—that will appear for the trade on April 1, 1918.—The Editor.)

DATA SHEETS FOR FUEL OIL ECONOMY TESTS

The Overload Test.—The sudden demands for power during certain hours of the day make an elasticity in boiler steaming qualities absolutely imperative. Otherwise, a great additional expense would be involved in the cost and installation of additional steaming units. Hence the overload steaming qualities of a boiler are of utmost importance, especially in central station or steam auxiliary practice.

As an instance of performance of a boiler under overload conditions on the Pacific Coast, an authentic case is on record where a boiler of 773 rated horsepower developed an overload of 75.7 per cent for 5 hours and still maintained a gross efficiency of 80.62 per cent.

The Quick Steaming Test.—In other instances the ability of a boiler to hastily get into action is of prime importance. This is especially true in cases where boilers are held in readiness for pumping station operation for fire protection. In San Francisco, California, for instance, is located a high-pressure water system whereby pumps stand eternally ready to deliver 12,000 gallons of water per minute to a height of 700 feet should disaster by fire ever again visit that municipality. The boilers that operate the pumping station have by test demonstrated that full boiler pressure and steaming conditions can be accomplished in less than thirty minutes time.

Again, other features of test are under special cases desirable to attain. But the two most important tests are those of ascertaining the conversion ratio of heat represented in the steam to the heat supplied by the furnace under normal conditions of operation and under certain definite overload guarantees—in a word, the ascertaining of boiler efficiency for normal rating and for conditions of overload.

Observations Necessary.—A complete tabulated list for final test computation is set forth in the book of instructions previously mentioned as approved or advised by the American Society of Mechanical Engineers. Let us now look into some of the details necessary to obtain this recorded data.

In the first place, one should note on a log sheet the general observations such as date of test, duration of test, type of oil burner, make of oil burner, number of burners used, and with this information should be compiled sufficient physical dimensions of the boiler to enable one to compute the builder's rating both for the boiler and for the superheater.

During the test period, observations are usually taken every fifteen minutes, simultaneously if possible.

Pressure Readings.—The pressure of the atmosphere is read in inches of mercury and the steam gauge readings of the boiler and superheater having been duly calibrated or corrected for mechanical inaccuracies, are then reduced to absolute pressure readings as set forth in the chapter on pressures.

The pressure of the oil under which it is forced into the furnace is also usually noted, although it has no bearing on data computation.

The pressure of the draft at various parts of the ash pit, furnace, breeching, and chimney are also noted by means of a multiple cock arrangement which was shown in the chapter on pressures. This arrangement makes possible the quick ascertaining of various draft readings by means of one instrument.

The pressure of the saturated steam and also that of the superheated steam is ascertained by inserting carefully calibrated steam gages, the one in the saturated steam compartment and the other in the superheater compartment. These pressures are then converted into absolute pressure readings by correcting for atmospheric pressure as set forth in the chapter on pressures.

Temperature Readings.—A thermometer is usually located in the atmosphere without to ascertain general external temperature conditions of the day. One is also placed in the boiler room to ascertain the temperature of the entering air passing into the furnace.

To ascertain the temperature of entering feed water and fuel oil, thermometer wells with thermometers are also installed at nearby points of entrance.

It is often desirable to ascertain the temperature of the furnace gases at various points in their journey. To accomplish this thermo-couples are installed at the points desired previous to the firing of the boilers and during the test an electrical pyrometer is advised, especially if other high temperatures are to be taken in various points of flue gas passage.

The Flue Gas Analysis.—Simultaneously with the taking of the temperatures, pressure and other readings of the test, the flue gas analysis is ascertained at frequent intervals. The detailed method of taking these data has been fully set forth in previous chapters and methods of computation of combustion data explained. The Heat Balance will be set forth in full in a later chapter.

The Test as a Whole.—The reader has now before him the taking of the test as a whole. At this point he should carefully review all the previous chapters alluded to in this discussion so as to weld into a solid chain the links that go to make up the boiler test in fuel oil practice.

Having thus in mind a complete idea of the various details involved in the taking of the boiler test data, we are now in position to link together the computed data involved in formulating the engineer's report of the economic results of the test.

Preliminary Tabulation and Calculation of Test Data

The systematic construction of a log sheet that will show in the minutest detail every incident in the progress of the boiler test is of prime importance. It is far better to overdo than to underdo in the gathering of detail data of this kind. The notation of remarks from time to time upon the log sheet concerning relevant observations during the progress of the test is of much service to the engineer when he finally comes to decide fine points in economic boiler performance.

No straight and narrow schedule or log sheet can be set forth to meet all types of boiler test. Each particular test as a rule involves its own particular tabulation. Let us, however, consider a series of tabulation sheets for boiler tests in which oil is used as a fuel. The suggestions that will be set forth illustrate a carefully evolutionized scheme of tabulation for such data that may be well followed in guiding one in the construction of his own individual log form should occasion arise.

The Log Sheet for Weighing the Water.—In the previous chapter we have seen that the water is brought to a definite height in the supply tank the instant of starting the test. Above this supply tank are located standardized scales upon which the water is weighed before emptying into the supply tank below. As a rule, at the closing of each hourly period, water readings are computed in order that the engineer may get a preliminary idea of the progress of the test. Blank sheets are given each water weigher, one to be used for each hourly period. Each sheet sets forth general information indicating the kind of boiler under test, the date of test, the name of the observer, and the particular tank at which each is stationed. A column is devoted to the number of the scale reading, a second to the gross weight of the water and tank before emptying into the tank below, the tare to be subtracted from the gross weight, which is the weight of the upper tank after the water is emptied into the tank below, and a fourth column setting forth the net weight or difference of the two preceding columns.

Log Sheet for Water Fed to Boiler.

Kind of boiler -----
Method of Starting Test -----
Date -----
Observers at Scales for Water -----

Reading	Time	Gross	Tare	Net	Temp. of Water	Remarks
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
Total		Signature: _____				

This sheet will have somewhat the foregoing appearance.

By using the type of log sheet above indicated, it is evident that the engineer has a check on his water computation, for in the line marked "total" the footing for the gross weight should exactly equal that for the sum of the tare weight and the net weight. A place is also given for a signature to be appended by the one responsible for the weight notation.

Log Sheet for the Fuel Oil Fed to Furnace.— Simultaneously with the weighing of the water, a similar log sheet is kept by another set of observers setting weighing proceeds, a periodic sample is taken to make forth the weight of fuel oil fed to the furnace. As the up a composite sample for the determination of the calorific value of the oil as set forth in the preceding chapter. The log sheet for the oil is quite similar to that used for the water and should be footed up at the end of each hourly period so that the engineer may have some definite idea of preliminary economic results. A suggestion for this log sheet is as follows:

Log Sheet for oil Fed to Furnace.

Type and Location of Boiler -----
Type of Burner -----
Type of Furnace -----
Date -----
Observers at Scales for Oil -----

Reading	Time	Gross	Tare	Net	Temp. of Oil	Remarks
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
Total		Signature: _____				

Other Data to be Taken.—The tabulation of data to determine the steam used for atomization and the analysis of the flue gases require special treatment, depending upon the particular method decided upon by the engineer to ascertain these factors. Previous chapters have already set forth in detail suggestions for the ascertaining of these quantities, and the reader is now advised to re-read them in order to correlate in his mind, as it were, all the data that must be taken in order to ascertain the economic performance of the modern boiler utilizing crude petroleum as a fuel.

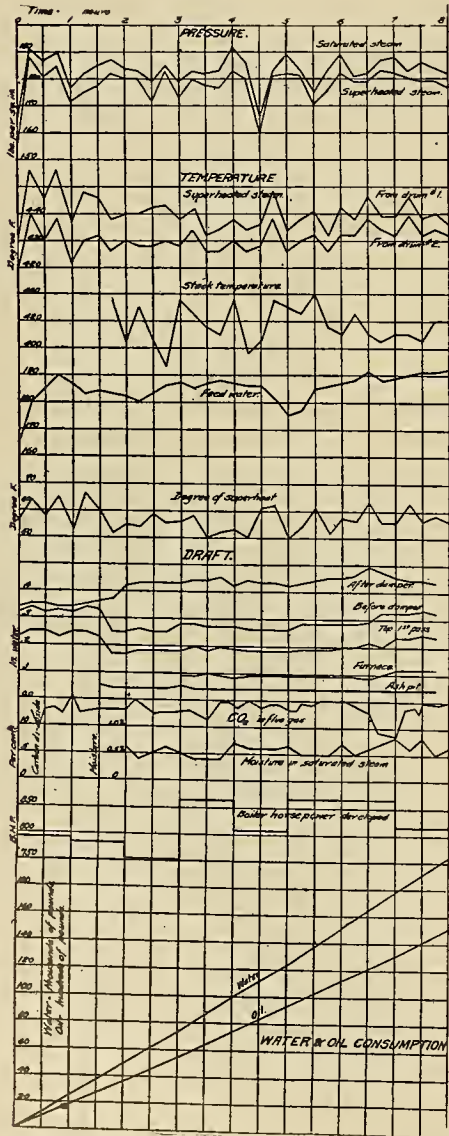
The General Log Sheet.—In addition to the two log sheets just described, a general log sheet is necessary upon which to note the temperatures, pressures, flue gas analysis and other information desired.

Here is an illustration of a suggestion for such a log sheet. At the completion of the test an average is easily obtained for the various readings by footing up the total and dividing by the number of readings noted. The columns for the water fed to the boiler and the oil fed to the furnace are footed and as in the hourly sheets previously described, the totals from these sheets which are noted on this general log sheet should now check—that is, the total gross should equal the sum of the total tare and total net columns.

THE GENERAL BOILER TEST LOG SHEET

General		Pressures			Temperatures										Water		Oil		Remarks				
Reading	Time	Atmospheric barometer	Steam pressure (saturated gage)	Steam pressure (superheated gage)	Oil pressure at burner	Force of draft in flue	Force of draft in ashpit	External air	Fire room	Air entering ashpit	Furnace 6 ft. from burner	Temp. of stack	Temp. of boiler at any other pt. desired	Oil at burner	Feed water entering boiler	Superheated steam	Gross	Tare	Net	Gross	Tare	Net	
1																							
2																							
3																							
11																							
12																							
Totals																							
Average																							

Signature of Observer.



THE GRAPHIC LOG SHEET FOR FUEL OIL TESTS

During the progress of a test a graphic plot most conveniently sets forth the behavior of the variables under observation. The above shows a typical graphic log sheet and its method of construction for fuel oil tests.

The reader is to bear in mind that the actual notations to be made in any particular test are not all set down in this general log sheet suggestion. For the information desired and the purpose of the test must in each given case determine these factors. The sheet will, however, serve as a general guide for such matters.

The Plotting of Test Data—As the test proceeds hour by hour, it is very instructive and helpful to keep a diagrammatic log sheet also. By this means a glance will often reveal certain irregularities that may be righted at their incipency. Such a log sheet is shown in the illustration and by reference to it the reader will observe how the history of a test may be simple and clearly set forth.

The Heat Balance

The steaming qualities of a boiler are best set forth by measuring its so-called efficiency. The efficiency of a boiler is the relationship between the heat absorbed per pound of fuel fired and the calorific value of one pound of fuel. Thus although each pound of fuel consumed in steam production is found to have a calorific value of 19,450 B. t. u. in the numerical illustration for this chapter, that portion alone of this heat which is actually represented in the steam itself is of economic value.

In the illustrative test which is made use of in the next discussion, it will be found that of this 19,450 B. t. u. represented in each pound of oil only 14,076.56 go toward power generation. It is then useful and instructive to analyze the losses in a boiler and see through what channels this heat has been dissipated. The major portion of these losses may be easily computed by means of data taken in the test. Those which cannot be mathematically computed are thrown under the column entitled "Stray Losses," and are made to represent such an amount that the total losses together with the useful heat generated in the boiler represent the heat from one pound of fuel.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

HUMAN NATURE

BY H. A. LEMMON

(If the man who is selling the goods could just get it out of his head that the customer is a mystery, and begin to figure intelligently just how that customer's mind works, he would be surprised how easy it is. Being able to predict the reaction which your words will produce in the other fellow is the essence of both good advertising and good selling. Some of the elements which underlie selling psychology are entertainingly presented in this suggestive article by a man who is past master in the advertising game.—The Editor.)



The human mind obeys the laws of nature, just as did the apple which fell on the head of Newton.

MAN never finds out just how a woman's mind is going to work until it's too late to do him any good," chants a rural philosopher and, because our sales are mostly made to women, many of us are prone to accept this estimate of the vagaries of the feminine mind as a full and sufficient explanation of our frequent and sometimes consistent failure to obtain results.

Perhaps woman herself has aided and abetted the promotion of an idea that she is incomprehensible. It has been stated that a subtle form of flattery is to pretend that you consider the lady of your momentary choice a deep, dark unfathomable mental mystery. She chooses to consider herself that way, and a standard point of attack is to suggest that she is woefully misunderstood by the rest of the world. But as this wasn't intended to be a treatise on how to be successful in love-making, we will content ourselves by merely remarking—Bunk!

The normal human mind is no more mysterious in its working than is a grindstone. What we are vitally interested in is how to best apply the crank.

And right here I am bang up against a most unpleasant necessity—a shock as it were. I simply have to use the word "psychology." Ugh! Of course it makes me shiver also. Applied psychology enables us to take the lid off a woman's brain and watch the wheels go around to see what makes it tick. You don't know what the word means? Neither do I—at least from the expert's standpoint; but for our purposes let's improvise one. It is "guessing what the other fellow will do before he does it"—possessing a knowledge of human nature as it were.

The psychology of figures enables us to foretell with considerable confidence that 2 and 2 make 4. You and I agree upon that: but there are still a lot of fellows who think that 2 and 2 make 22. Instead of accepting the obvious answer to such problems as con-

front them in every day life, their minds approach each one suspiciously as though it were a "catch" conundrum. They immediately reject the real solution because it is so obvious, and they wander off down the byways and alleys of complication and mystery and ponder and weigh this theory against that one until they are far more likely to entirely lose the



You know what a baby will do if you stick a pin in it—and you know it beforehand. Well, a customer is not so different.

original problem than they are to solve it. The man who wrote that quoted opening sentence about a woman's mind is one of them. For the fact is that our minds perform as a general thing, absolutely mechanically and strictly along certain century-worn grooves.

In thinking we think, and in arriving at conclusions and results, we unconsciously obey certain rules and fundamental laws of nature just as surely as though we were adding 2 and 2, or constructing a bridge. Knowing the rules of the game—the 2 and 2 of the mind—we can foretell with gratifying accuracy what appeal will get Mrs. Smith's signature on the dotted line; and we can begin to call ourselves amateur psychologists. And that is positively the last time we are going to use that word.

But to go back. Just for illustration, we will place an average person on our dissecting table and investigate the mental mechanism. Because we must assume a sex and condition of some sort, we will say our specimen is a young mother in moderate circumstances. While she steps into the dining room to answer the telephone we will stick a half dozen pins in her baby who is playing on the kitchen floor. "Ah, ha," you say, "the baby will cry."

Fine! We are getting there, for we have already anticipated a definite mental reaction in the baby. The mother rushes in and catches us at it. She seems annoyed, doesn't she? Great! We have guessed the solution of 2 and 2 again. Simple, isn't it? Being a mother she is of course utterly unreasonable, and after swift attention to the squalling youngster she grabs a poker, a broom, the flatiron and a chair. Why? She doesn't seem to love us any more; and as soon as we have made our escape she has the baby in her arms and is crying and fussing over it. She does love the baby. Later on we may determine that she loves her own baby more than she does other babies. Chalk up those two facts in your brain also. They are a liability against the family pocket book.

So we have found that certain combinations of

circumstances, which we can bring about, may be depended upon to stimulate love and hate in the mind of one who a few minutes before was a perfect stranger. And just as we are able to bring both to an outward expression by our own acts, to that extent at least we learn that we can guide her emotions. For selling purposes it of course is just as well not to arouse her hate—of ourselves. Let us hope that it is confined to her husband or the neighbor's small boy next door. Better still, consider hate a waste product and let it alone.



You can get her if you know what she likes

Perhaps our woman was a promising musician before the details of household cares interfered. Her husband comes home after a stormy parting in the morning and as a peace offering brings two tickets for the concert. She attends and enjoys every moment—that is, every moment that she isn't wondering whether the baby at home is fussing and whether the girl is awake and attentive. Tickets to a concert brought enjoyment. Knowing that she loved music, wasn't it a mere 2 and 2 problem that they would?

Suppose we tell her that her baby is the most beautiful baby in the whole neighborhood. We can extend this territory to include the entire city if we are clever enough to avoid a suspicion of flattery, and mothers of babies are not very suspicious of this sort of propaganda. Is she pleased? Will a girl eat candy? Of course she knew it all the time, and her faith in our keen discernment and uncanny judgment is augmented to a point nearly approaching 100 per cent. Two hours later that baby will have its face washed and will be dressed up to live up to its position as the handsomest baby in the city. Why? Pride of Motherhood.

And we find that by our outside acts we have caused her to feel the human emotions of love, hate, enjoyment and pride. We have absolutely created

those passions in her brain, just as we might go on down the list of human emotions and guide her into feeling every one of them. In other words, she experienced just the sensations we previously determined she should experience. The knowledge that certain circumstances (which are under our control) will surely produce certain results in her brain (which to that extent is also under our control), is the salesman's psychol—came near breaking that promise—is the salesman's foundation for a successful career.

There isn't any mystery about it and nothing that any of us cannot learn rapidly and apply. We already have learned it, but possibly have not thought of applying it.

The trouble is that we plain, ordinary fellows who want to be real salesmen, and therefore seek expert information as to the best and shortest manner in which to equip ourselves for the work, are immediately confronted by a lengthy analysis of mental processes and technical discussions which come a bit too fast for our comprehension. And yet it all can be boiled down to what I have written here—that is, if I have succeeded in writing what I meant to write. Those incidents of the baby and the theatre tickets contain the entire foundation principles of the science of salesmanship just as thoroughly and completely as is necessary to enable each of us to qualify—if we will apply it.

Now, it must occur to us that this power to cause any desired emotion in our prospect's mind is placing a tremendous weapon in our hands. In other words, we can meet a perfectly strange lady and force her to feel just what we wish her to feel. If we do admit that this can be done, we also must admit that salesmanship is a science and also that, to use an automobile phrase, "it is perfectly simple and simply perfect."

However, there are ways of arousing a mother's emotions that are more subtle and more productive of orders than sticking pins in the baby. I understand the best salesmen have nearly all discarded that method as somewhat crude and lacking in finesse. A little later we will take these emotions we have created in her brain and endeavor to see how we can use them to our advantage and hers.



A beautiful piece of flood lighting installed by Eardley Bros. of Salt Lake City, which suggests opportunities for contractors elsewhere. The building is that of the Administration offices of the Utah University and is lighted by ten 500-watt type "L-1" G. E. flood lighting projectors. The photograph was taken at 9:30 p. m.

Customer's Comments

("Shopping" is a term whose application is confined to women. That state of mind in which the customer is faintly receptive to any advances which the day may bring is a peculiar opportunity which is yours for the grasping. This remarkable article by a woman who started out in the morning a good "prospect" and who almost bought an electric heater—but didn't—should set you thinking. Would she have made the purchase had she gone into your store?—The Editor.)

One frosty morning as I lit my gas-grate I wished idly for a heater which was inexpensive, attractive and did not leave one with a hot head and cold feet. I knew vaguely that there were electric heaters, but their superiority had never been demonstrated to me, and so the idea slipped out of my thoughts.

I had to go into town on a few errands later in the day, and was loitering by the shops when I was startled by the quick movement and flashing lights of a sign in a show window. I stopped to investigate, and as I marveled a gentle warmth at my elbow drew my attention to a jolly little electric heater out by itself on the street, bearing an invitation to go inside and learn all about it. As I had been wondering about it, I decided to accept with pleasure, and went into the store. After I had closed the door and looked around a young thing unfolded herself and asked laconically if I had come in for something. A little surprised, I assured her I had and began to flood her with questions about the operation of the heater, how it was made, in what points it was superior to its competitors, and finally, why I should get one instead of using my gas heater. She tucked her hair in with artistic fingers and said she really didn't know, but Mr. X. Y. Z. could tell me if I would step in later. So I stepped out, rather regretting that the bright little heater had not had a selling tongue to back up its bright and taking appearance.

Having lost the first thrall of enthusiasm, I still had an unsatisfied feeling which prompted me to pause before a competitive shop down the block. It presented a rather bleak display of grimy looking machinery which was not in the least appealing. My eye wandered to the showcase of the millinery store adjacent, whose bright, attractive picture contrasted favorably with this deadly uninteresting window with its array of articles which bore women. I wondered if the proprietor had ever studied the buying public, especially women? Women are always attracted by beautiful and carefully planned displays. I have been told that most of the merchandise sold from the windows is sold within a few hours after the display is placed.

My meditations were halted when to the rear something glittered, and my interest picked up. Responding to its "come hitherness," I went in. To my surprise, the store was immaculate—with floors that attested many successful trips by the vacuum cleaner. Built in the walls were black-lined cases with inner illumination displaying a few highly polished articles. There was never a duplicate, but each had its separate setting—a toaster, an electric iron, a chafing dish, a coffee urn which shone like silver in a jeweler's beautiful case. I began to make women's visions—surrounding them with white napery, flat silver and pret-

ty breakfast china; I love the "put-put" of an electric percolator. The gleam of an electric heater caught the tail of my eye. I walked to the round table on which it was exhibited and my imagination completed the breakfast room—cozy and pretty, with the charm of the rosy, glowing heater—no dust, no dirt, no difficulty. I looked around enthusiastically to ask the price and to have a few doubts allayed, but—one salesman was carrying on a very pleasant telephonic conversation, leaving his confrere to serve half-a-dozen impatient customers. I strolled around for a few minutes with emotions beginning to cool. The enthusiasm of my picture finally succumbed to the potent arguments of common sense, which included no reason why my gas heater wouldn't do. By that time I had wandered to the door. I was almost grateful that I had gotten out, several dollars in, and had enjoyed the exhibit of wares with trouble to no one.

Having given up all thought of purchase, I paused before another store of electrical appliances out of curiosity. Out of nothing else, for as far as my confused eye could travel, were electric irons, wall plugs, cords, bulbs, lamp shades, nails, screws, till I wondered what on earth it was they wanted to sell me. Crowded merchandise, no sign of lay-out, nothing balanced, the merchandise in the foreground in some cases higher than that in the background, had spoiled the entire effect. In a spirit of fun I thought I would go in just to see what would happen. I had no sooner stepped inside than an eager young clerk pounced upon me and led me off to the heaters. He knew every detail of his goods; every criticism was overthrown; and his enthusiasm became mine. Wondering how I had ever got along without one, I was about to order, when he asked me to sit down a minute to see if I didn't like the temperature. But I saw more than that. Over a motley array of washing machines, vacuum cleaners, batteries, suit cases, dust had settled triumphantly revealed even in the rather bad light. My eye lit on the heater, and I noticed that it was not only dusty, but the copper needed polishing. My gas grate didn't. "Thank you for the trouble," I said, departing. "I'll think about it."

And I thought that the proprietors should have backed up their excellent salesman by providing him with a spotless, dustless space, arranged with a rug and comfortable chairs, in which to make his demonstrations. Then the chairs should be placed in front of an attractive, electrically decorated wall, for when the floor salesman is demonstrating and making a sale, he needs the customer's undivided attention. By arranging the chairs this way, the customers can't see who's passing in and out of the store. They aren't distracted.

But suppose I had been attracted by a well ordered, inviting window and had wandered that first time into a shop whose arrangement and bright up-to-date-ness had suggested all the inviting possibilities of that electric heater I was wondering about. Suppose a salesman had talked to me who knew his article and had swept away my doubts by strengthening that picture which he must have known was in my mind. Suppose—but after all, it didn't happen.

And hereby endeth the tale of how I found out that my gas grate had its good points after all.

AN HOURLY SALE

BY W. R. PUTNAM

(A special sale which held its interest through every hour of the day, not only bringing new people to the store but keeping the same ones there to buy and buy again, was the recent achievement of the Utah Power & Light Company's sales department. The interesting story of how the details were worked out is here given for the benefit of those who may conduct similar campaigns on a smaller or larger scale. That it paid is attested to by the figures of sales given at the end.—The Editor.)

As a final wind-up for the excellent appliance sales of the year, we decided to put on a "special" for the last day in the way of a demonstration sale. This was advertised in the Sunday papers as an "Hourly Sale"

for one day only MONDAY
A NEW GIFT BARGAIN
EVERY HOUR
ELECTRICAL

You'll be interested because it's the very last word in Christmas shopping—new electrical gifts every hour all day Monday—at very special, low bargain prices. For every hour of the day. The sale begins promptly at 10 o'clock, Monday, and the SPECIAL PRICE THAT HAS BEEN SET ON EACH APPLIANCE WILL HOLD GOOD FOR ONE HOUR ONLY. As the clock strikes 11, the demonstration is over these windows. Later, the schedule below—select the appliance you're interested in—match the time and buy there promptly. Try each or a small dozen, the balance monthly—you get the special bargain price in either case.

It's Your BIG Opportunity to Give Something Electrical
Below are the bargains and the hour each appliance will be on sale in the special prices.

10:00-11:00 Curling Irons Regular price, \$4.50 Special price, \$3.50	11:00-12:00 Toasters Regular price, \$5.00 Special price, \$4.00
12:00-1:00 Turnover Toasters Regular price, \$5.00 Special price, \$4.00	1:00-2:00 Universal Toasters, No. 946 Regular price, \$5.00 Special price, \$4.00
2:00-3:00 Hotpoint Eltosto, with rack Regular price, \$5.00 Special price, \$4.00	3:00-4:00 Hotpoint Elperco, aluminum Regular price, \$8.00 Special price, \$5.00
4:00-5:00 Christmas Tree outfit, 16 light Regular price, \$8.00 Special price, \$6.50	5:00-6:00 Hotpoint 4 inch disc stoves 1 heat Regular price, \$4.50 Special price, \$3.50
6:00-7:00 Westinghouse 4 inch disc stoves 1 heat Regular price, \$4.50 Special price, \$3.50	7:00-8:00 Large Elboilo Regular price, \$5.50 Special price, \$4.50
8:00-9:00 Radio Egg Cooker, with milk warmer Regular price, \$4.25 Special price, \$4.00	9:00-10:00 Irons Regular price, \$5.00 Special price, \$4.00

UTAH POWER & LIGHT CO.
"EFFICIENT PUBLIC SERVICE"
GROUND FLOOR KEARNS BUILDING

A good sized advertisement was run in the Sunday papers permitted the setting for the hour following the one in operation to be made up and gave ample time for making ready for the change without confusion.

The schedule, with plans in detail, was as follows:

Ten A. M. to Eleven A. M.

The feature for this hour was the Westinghouse toaster stoves, which were arranged about the window with a demonstration table neatly equipped. Hot cakes, ham and eggs, toast, etc., were prepared on this device. The young woman in charge of the demonstration was responsible for having the necessary materials on hand.

Prices	
Regular.....	\$7.00
Special.....	\$5.50

Eleven A. M. to Twelve Noon

A special salesman was appointed to look after the demonstration of vacuum cleaners, using the necessary materials such as sawdust, lint, etc., to show what a real vacuum cleaner will do.

Prices	
With Attachments	Without Attachments
Regular	Regular
Special	Special

Twelve to One P. M.

All small appliances selling for five dollars or less were displayed, consisting of:

	Regular	Special
Westinghouse Curling Irons.....	\$4.50	\$3.50
General Electric Toasters.....	5.00	4.00
Westinghouse Turnover Toasters.....	5.00	4.00
Universal Toasters, No. 946.....	5.00	4.00
Hotpoint Eltosto, with rack.....	5.00	4.00
Hotpoint Elperco, aluminum.....	8.00	5.00
Christmas Tree outfit, 16 light.....	8.00	6.50
Hotpoint 4 inch disc stoves 1 heat.....	4.50	3.50
Westinghouse 4 inch disc stoves 1 heat.....	4.50	3.50
Large Elboilo	5.50	4.50
Radio Egg Cooker, with milk warmer.....	4.25	4.00
Irons	5.00	4.00

The duties for demonstrating these different appliances were assigned to different people, who were responsible for their particular portion of the demonstration.

One to Two P. M.

Provision was made for displaying vibrators during this hour. Heating pads were also included in the demonstration as appropriately combining with the vibrators.

Prices		Regular	Special
Rex No. 1.....		\$17.50	\$12.50
Royal No. 1.....		17.50	12.50
Royal No. 2.....		22.50	17.50
Royal No. 3.....		25.00	20.00
Heating Pads, Hold Heat.....		4.00	3.00
Westinghouse Heating Pads.....		8.50	7.00
Universal		8.50	7.00
Elcomfo Aluminum		5.00	4.00
Elcomfo Flexible		6.50	5.00
Hotpoint Foot Warmers.....		6.00	4.50



The pleasant interior of the Utah Power & Light Company's retail store. Demonstrations were carried out in the window while at the same time the various articles demonstrated were put on sale at special prices within the store. Many sales were made even before the feature sale commenced—and the store was obliged to keep open past closing hours to satisfy the customers. In all \$2481.12 worth of appliances were sold in one day.

Two to Three P. M.

A little girl was found to demonstrate the Junior electric ranges.

Prices	
Regular.....	\$8.00
Special.....	\$6.50

Three to Four P. M.

The washer demonstration was put into the hands of one of the salesmen, who was responsible for the window properties, consisting of an Automatic No. 4 and a Thor No. 25.

	Prices	
	Regular	Special
Automatic No. 2.....	\$65.00	\$55.00
Automatic No. 4.....	72.50	62.50
Automatic No. 6.....	80.00	70.00
Thor No. 25.....	100.00	90.00
Thor No. 20.....	80.00	70.00

Four to Five P. M.

The Western Electric sewing machine was demonstrated at this time. Particular emphasis was placed in the display on the advantages of the Sew E-Z motors. Arrangements



Crowds gathered outside the store and then made their way within it to take advantage of the hourly bargains

were also made for the regular type sewing machine, showing the application of the motor, and small tables were provided for demonstrating the regular Western Electric line.

	Prices	
	Regular	Special
Type No. 1.....	\$37.00	\$32.00
Type No. 2.....	48.50	43.50
Type No. 3.....	58.50	50.00
Sew E-Z motors.....	15.00	12.50

Five to Six P. M.

The feature of this demonstration was the fancy holiday-ware appliances, consisting of Universal Loving Cup sets and sets of all kinds, with percolators, chafing dishes, etc. Provision was made to demonstrate this class of goods on a tea table.

Prices featured; 10 per cent was allowed on all holiday-ware during this hour.

Seven to Eight P. M.

The same merchandise was featured as described for the hour from five to six p. m.

Eight to Nine P. M.

Universal and Hotpoint ovenettes and grills were demonstrated.

	Prices	
	Regular	Special
Grills, 1 heat.....	\$7.00	\$5.00
Grills, 3 heat.....	7.50	6.00
Ovenettes.....	3.50	3.00

No distinctions were made between time and cash payments, the prices as given here applying for both.

The attempt was the first of its nature to be tried by a Central Station Company and we looked forward with much interest to the possible returns. We had used fourteen people on our sales floor in addition to two demonstrators. Some sales were made prior

to 10 o'clock, the opening of the Hourly Sale. We were obliged to keep the office open until 11 p. m. that night in order to take care of delayed shoppers. The total number of sales made on that one day were 487.

A great amount of material placed on sale at special prices during certain hours was sold during other hours at the regular price. That the sale was a success may be judged by the following record of the day's business:

	Number	Amount
Lamps .....	..	\$222.07
Discs	4	19.49
Toasters	21	113.63
Percolators	19	249.28
Irons	23	107.75
Radiators	5	35.00
Washing Machines.....	4	280.00
Vacuum Cleaners.....	25	831.83
Utility Motors	4	48.10
Other Appliances	68	427.31
Miscellaneous	12	66.70
Hughes, Jr. Ranges.....	11	79.97
Total Sales.....		\$2481.12

PROFIT AND TURNOVER

BY F. B. MILLIGAN

(An interesting suggestion of how to increase your profits without increasing your investment by merely collecting your bills promptly is made here by the credit manager of the Northern Electric Company, Limited. This paper, presented before the recent convention of British Columbia Electrical Contractors and Dealers, is of particular value as coming from a country with problems so similar to our own.—The Editor.)

A serious obstacle to organization work is the large number of retailers who, having but little knowledge of business principles, cannot see the benefit which an organization might give them. It then devolves upon the loyal members of the association to educate these people to the benefits of organization.

Consideration, courtesy and right intent all add to the sum of human happiness. Not only do they benefit those to whom they are extended, but they survive in various forms and add to the well-being of the business world.

Quality plus Service is the basis on which prices are made. Competition in quality and service is a healthy condition, but competition in price alone tends to business ruin.

It goes without saying that we are all in business for the net profits we can make. The two ways of increasing the net profits on a given volume of business are to keep the expenses down, and to increase the gross profits without correspondingly increasing the expenses. We all realize that net profits depend on gross profits and expenses, but there is a keen appreciation of the fact that net profits also depend to a very large extent on investment. The net profit on any particular sale is, of course, the cost of the goods less the expense of doing the business, but the net profit for a year is determined by the number of sales. If a merchant's capital is tied up in an unwarranted investment, the number of his sales, unless his borrowing capacity is unlimited, is necessarily decreased; that is, he hasn't money available for the purchase of goods to sell at a profit, and of course his net profit for the year is reduced.

For example: Suppose that a merchant has an investment in merchandise equal to sixty days' sales (which may be considered a fair standard). Then if his investments in receivables is equal to thirty days'

sales, he has a total investment equal to ninety days' sales; that is (since ninety goes into three hundred and sixty four times), he is turning his investment over four times a year. If the net profit of each turnover is 5 per cent he makes a total net profit of 20 per cent on his investment. Now suppose he isn't so good a collector; he collects in sixty days instead of thirty. Then he carries an investment in receivables equal to sixty days' sales, or a total investment in merchandise and receivables equal to one hundred and twenty days' sales, and gets three turnovers a year instead of four, making a total net profit of 15 per cent instead of 20—a decrease in annual net profits of 25 per cent, as a result of allowing sixty days' credit, rather than thirty; and if he collects in ninety days, he carries an investment equal to one hundred and fifty days' sales, turns his investment over two and two-fifths times a year, and gets a net profit of 12 per cent—a decrease of 40 per cent as a result of allowing ninety days' credit instead of thirty.

Twenty-five per cent on \$100 wouldn't feed a big family very long, but 10 per cent on a thousand dollars is four times as much. The rapid turning over gives volume and increases your cash discounts rapidly.

One hundred dollars turned twelve times in twelve months, with a 2 per cent discount every thirty days, will give you 24 per cent margin every year. If you made no greater profit and your capital is sufficiently large, you can make all the money you need.

A good assortment is one of the fundamental principles of a successful retail store. The jobber is best fitted to supply that demand. Quick sales and fair profits bring great results.

Your total net profit for each day is what counts; therefore it is necessary for you to know what you have done today, and if you show no gain try a different plan and work harder tomorrow. You must have a goal and try to make it.

IF I WERE A JOBBER

BY M. L. SCOBEY

(A talk that is well worth while, by a man who, although not a contractor, is in a position to speak from their viewpoint. The author spoke recently on this subject before the San Francisco Electrical Development League.—The Editor.)

I am not in a position to tell you what I would do if I were a jobber, because the jobbers have had their association now for many years, and through that intercourse have pretty thoroughly entrenched themselves, evidently taking advantage of the other fellow's experiences and through the exchange of problems and and ideas, and ideals if you will, have today gotten their separate businesses so well organized and perfected that there is little or nothing to be said in criticism.

However, I have my ideas as to what the dealers would like to have the jobber do—and while these suggestions are not directed at any one particular jobber, they are privileged to take it unto themselves if the shoe fits.

One of the principal items that we deal in is that of socket current-consuming devices, which embraces irons, toasters, percolators, curling irons, air heaters,

etc., all of which are procured from the jobber, who, in most cases, is the sole distributor and representative of the manufacturer. Now, I know of only one jobber in the city (and also with one exception I deal more or less with every one of them) who carries an adequate supply of repair parts and accessories for the line he carries and represents.

You can realize that the dealer is not in an enviable position when a customer brings in a broken or defective device and, after leaving it for repairs, makes a special trip the following day to get it, fully expecting, and justly so, that it will be ready. In a great number of cases he has to be told that the needed part is not to be had in the city and that it will have to be forwarded from the factory, taking possibly two or three weeks.

To put it mildly, the customer is disappointed and annoyed, often-times openly blaming the dealer who really is not to blame at all. The dealer then is forced to see a dissatisfied customer walk out of the store. And what the dealer needs to build up his business is satisfied customers, not dissatisfied ones. Now, while the jobber is not directly in on the deal, it eventually reacts on him.

Another thing of importance is the matter of credits. I don't know why it is or why it should be so, but the fact remains that it takes all the jobbers about three times as long to get a credit through their books as it does to get a bill or order. We all make mistakes and sometimes it is the dealer's and sometimes the jobber's employee's fault or mistake—but if a credit is due, why not have it put through as promptly as the rest of their business?

Last, but by no means least, I firmly believe that the jobbers should absolutely close their doors to retail business—and when I say "retail business," I mean retail business in its true sense. Upon investigation I find that jobbers of other lines do not and will not sell at retail, so why cannot the same conditions prevail in the electrical business. When I was connected with a jobber here, I remember waiting on a lady who drove up in her limousine and purchased two Xmas tree outfits at \$15 each. She paid full retail price, but if that sale had been made through the dealer, the jobber would have made his legitimate profit, the customer would have had the goods at the same price, and the dealer would have had a chance to perform his function as a dealer should, and every party concerned would be satisfied.

It is a peculiar thing with human nature, but nevertheless a fact, that if a person is given an opportunity of buying at a wholesale house, even though he pays full retail price, he seems to think he has gotten the best of the dealer. The worst part of it is, he has, but he has not benefited himself.

I believe I am safe in saying that any man can walk into any electrical jobber's establishment today and purchase a single socket or attachment plug, or a woman can buy a percolator, provided they pay the same price they would if they bought from a dealer. It is probably true that if the jobber discontinues the practice of selling at retail, he will lose at first by so doing, but, in my mind he will more than make up any such initial loss in the long run.

CHANGES IN THE NATIONAL ELECTRICAL CODE

BY G. A. CLEARY

(An interpretation of the changes which have been made in the 1918 edition of the National Electrical Code, soon to appear, is here given, which will be of particular value to those making electrical installations. New rulings on motors, switches and groundings, a revised general code for moving picture houses and garages, as well as many minor regulations, will be included—and are here briefed in these columns. The author is of the technical staff of the Board of Underwriters of San Francisco.—The Editor.)

The forthcoming issue of the National Electrical Code will embody certain amended and additional requirements, which are of particular interest to the electrical contractor and worker.

The rules in the main are the same as those contained in the 1915 edition of the National Electrical Code. The major changes relate to method of grounding electrical equipment, conditions under which insulating joints may be omitted on fixtures, installation of service switches, motors, electrically operated organs, identifying insulating covering on three-wire and two-wire circuits with one grounded conductor, and construction of junction boxes.

No reference will be made here to sections of the code in which the phraseology has been changed but where the effect of the rule will remain unaltered.

Sec. 1. Generators: The safety device or devices must now be so placed as to disconnect the generator from all conductors of the circuit where the generator, not electrically driven, supplies a two-wire grounded system.

Sec. 2. Conductors: (b) Conductors having an insulating covering must, where they are closely grouped as on switch boards, in wire towers, cable ways, etc., each have a substantial flame-proof outer covering.

Section 8. Motors: (b) Motors operating at a potential between 550 and 3500 Volts must be wired with approved multiple conductor, metal sheathed cable in approved metal conduit. Except where exposed to moisture a metal sheath need not be provided over splices, but the ends of the sheaths must be belled out and sheath must be bonded around splices by No. 6 B. & S. gauge copper wire and approved ground clamps.

Where motors operating at a potential between 550 and 3500 Volts are located in a special room or vault adjoining an outside wall and the conductors entering from the outside are not in conduit, the conductors may be rigidly supported on glass or porcelain insulators which keep them at least 1 inch from the surface wired over and not less than 8 inches apart, except at motors and devices.

(b) Conductors carrying the current of only one motor must be designated to carry current at least 10 per cent greater than that for which the motor is rated; this has been changed from 25 per cent, which is now required by the 1915 edition of the National Electrical Code.

Additional percentages of the name-plate rating are mentioned in addition to the 30 minute current rating of motor and now referred to in Sections 8-D.

(c) A switch will be required on the supply side of each auto starter or group of auto starters. In localities where it is customary to provide a switch at the distributing center, to disconnect fuses, and where these fuses are the feeder or starting protection to the motor, it will be accepted as fully filling the new requirements. Where this construction does not obtain a switch will be required immediately ahead of each auto starter or group of auto starters. When an A. C. starter, when in running position, opens all wiring in the circuit automatically under over-load, it may also serve as a circuit breaker.

(c) The percentages of the full load currents of motors requiring large starting currents and where such motors are started by means of auto starters, have been changed to read:

Rated Full Load Current	Percentage
0 to 30 amperes.....	250%
Above 30 amperes.....	200%

Alternating current motors operating freight or passenger elevators or cranes that are dependent on phase relation for the direction of rotation, must be protected by approved automatic circuit breakers (or reverse phase relay) operative in the event of any phase reversal that would cause a reverse motor rotation, or in the event of the motor being connected to the line single phase.

Sec. 9. Feeder Protection: Oil circuit breakers and switches must, wherever practicable, be isolated from other switches and apparatus; on circuits of over 7500 volts they must be of the remote control type and be enclosed in separate fire-proof cells or compartments.

Sec. 15. Grounding Low Potential Circuits: New rule which refers to grounding of direct current and alternating current distributing system.

Sec. 15. (a) Method of Grounding When Protective Grounding Is Required: New rule regarding the point of attachment of ground connection on direct and alternating current systems, lightning arresters, ground protectors, electrical equipment, metal conduit, armored cable and metal raceways.

Where the service conduit is grounded its ground conductor must run direct from it to the ground connection. Interior conduit, armored cable or metal raceways if well bonded to service conduit, grounded as provided in the new rule, need no additional ground connection.

Ground Conductors: In all cases the ground conductor must be of copper or other metal which will not corrode excessively under the existing conditions, and if practicable must be without joints or splice.

The insulation and installation of the ground conductor for circuits must comply with all the requirements of the Code for wires of the voltage of the circuit to which the ground conductor is attached, and must have after January 1st, 1919, an identifying cover. In no case shall an automatic cut-out be inserted in a ground conductor or connection, except in ground conductors for equipment where its operation will disconnect all leads connected to the equipment from the circuit conductors.

The ground conductor or conductors for circuits must in general have combined current capacity sufficient to insure the continuity and continued effectiveness of the ground connection under conditions of excessive current caused by accidental grounding of a normally ungrounded conductor of the circuit. No individual ground conductor shall have a smaller current capacity than No. 6 B. & S. gauge copper wire. For the frames of electrical equipment current capacity of the ground conductor must not be less than that provided by copper wire of the size indicated in the following table:

For portable equipment protected by fuses not greater than 15 amperes No. 14 ground wire may be used.

Capacity of Nearest Cutout Protecting Equipment.	Requiring Size of Ground Conductor.
0-100 amperes	No. 10 B. & S. gauge
101-200	6
201-500	4
501 amps. above	2

The grounded circuit wires must not be used as ground wire for equipment, etc., and grounded conductors from equipment, etc., must not be connected to grounded circuit wires.

Sec. 23. Automatic Cutouts:

(a) Automatic cutouts must be placed in all ungrounded service wires.

Where service switch, service fuses and meter are combined in an approved self-contained device or compact combination of such devices having no exposed wiring or live parts and no part unprotected except potential coils of the

meter, such potential coils may be connected on the supply side of the service fuses.

(b) Receptacles for attachment plugs are now considered as requiring not less than 40 watts and may therefore be connected to lighting circuits.

Sec. 24. Switches:

(a) Must be placed on all service wires, either overhead or underground, at the nearest readily accessible place at the point where the wires enter the building.

Service switches must be arranged to cut off the entire current from all circuits and devices, including meters, except as provided in the following paragraph:

Where service fuses and meters are combined and in approved contained unit device having no exposed wiring or live parts and no parts not protected by the fuses, the switch may be so arranged or installed that it will not disconnect the meter from the supply line provided it does disconnect all lines of the supplied house circuits.

With three-wire direct current or single phase system with grounded neutral, the service switch may be so designed as to permit either outside wire to be opened independently of the other, and the design must be such that the neutral cannot be opened without opening both outside wires. It will be noted that switches may now be placed in the outside wires of single phase systems with grounded neutrals and that they may be opened independent of the neutral; this would mean then that two-pole switches are satisfactory for service switches for three-wire single phase systems and single pole switches on two-wire single phase systems. This change will necessitate absolute certainty of the identity of the grounded conductor where they are connected to the service switch so as to obviate any possibility of improperly connecting the service switch.

Sec. 25. **Heating Devices:** The sub-divided circuits of a heater need not be separately fused.

Where the capacity of the heater does not exceed 15 amperes or 1650 watts, an approved plug connector may be employed in lieu of a switch. Switches controlling sub-divided circuits of a heater are not considered to take the place of the main switch called for by this paragraph.

The single pole switches on the individual units of electric ranges are not to be considered as taking the place of the switch for the control of the entire unit.

Sec. 26. Wires:

(a) (After Jan. 1st, 1919.) The neutral conductor on all three-wire circuits and one conductor on two-wire circuits must have an identifying insulating covering readily distinguishing it from other wires. This wire must be run without transposition throughout the entire installation, properly connected to all fittings to properly identified terminals in order to preserve its continuity.

When one of the circuit wires is to be grounded the ground connection must be made to this identified wire.

(f) In unfinished attic or roof spaces wires to be considered as exposed to mechanical injury and must not be run on the upper edge of joists, except that in inaccessible roof spaces where wires are on the cross joists they must be supported on knobs on the upper edge of each joist.

Unless a five-inch separation is maintained each meter lead must be separately encased in flexible tubing.

Sec. 28. **Interior Conduit:** For sizes not greater than No. 10 B. & S. gauge one more conductor than permitted by the table Size of Conduits for the Installation of Wires and Cable may be installed in the specified conduit, provided the conduit is not longer than 50 feet and has not more than the equivalent of two quarter bends from outlet to outlet and the bends at the outlet not being counted.

Sec. 30. Fixtures:

New rule indicating when insulating joints and canopy insulators may be omitted on straight electric fixtures connected to knob and tube work, straight electric fixtures connected to metal conduit system or to properly grounded gas piping systems, straight electric fixtures grounded to a separate ground wire and combination fixtures where the gas piping is grounded.

It may be pointed out that this new rule:

(a) Specifically mentions the use of wires with 3-64th inch rubber insulation as one condition for the omission of the insulating joint and canopy insulator.

(b) A further condition is now to be based upon the grounding of fixtures connected to conduit or gas piping systems of fixtures which are separately grounded and the absence of a ground in the case of knob and tube wooden raceway and open work.

It eliminates wholly the former provision for sockets having porcelain or equivalent insulations, thus admitting the use of common brass shell paper lined sockets, etc., on fixtures without insulating joints or canopy insulators.

Under the new rule sockets and receptacles for different attachment to conduit and metal raceways and on outlet boxes and fittings may have paper or fibre insulations between current carrying parts and outer metal shelves provided they are so designed and installed that the shells are permanently and effectively connected to the grounded circuit, metal raceway, metal cover of outlet box, or other similar support, and provided the connecting wires have 3-64ths inch rubber insulation. In other words, on such supports sockets and receptacles of fibre or paper insulation may have grounded instead of insulated outer metal shells or other non-current carrying parts.

This change in the rule makes possible certain changes in the design of the sockets and receptacles expressly intended for use on conduit and metal raceways.

It also permits the use of ordinary "fibre lined" sockets on outlet box covers, condulets, etc., without insulation between the socket shelves and grounded metallic system.

Sec. 32. Flexible Cord:

(h) Must, where passing through covers of outlet boxes, be protected by approved bushings expressly designed for this purpose, or the cover must be provided with a smooth, well-rounded surface on which the cord will bear.

Sec. 37. (a) Electrically Operated Organs:

New rule applying to those electrical circuits and parts of electrically operated organs which are employed for the control of the sounding apparatus and keyboard.

Sec. 38. (a) Moving Picture Factory and Studios and Moving Picture Equipments:

New rule regarding the wiring and equipment in buildings in which motion picture films are manufactured, exposed, developed, printed, rewound, repaired, stored, etc.

Sec. 42. Garages:

(c) Flexible cord for portable lamps, motors, or other apparatus must be approved cord designed for rough usage, preferably stage cable or packing house cord.

Sec. 59. Outlet, Junction and Flush Switch Boxes:

Junction or pull boxes of over 150 cubic inches in size must be of metal and must comply with the detailed specifications for cutout boxes except that covers may be single flat sheets secured to the box proper by screws or bolts instead of hinges, if desired.

Boxes having covers of this form are for use only for enclosing joints in conductors or to facilitate the drawing in of wires and cables and are not for use of enclosing switches and cutouts or other forms of control devices.

Technical Hints

BY GEORGE A. SCHNEIDER

(The type of cables to be used in interior telephone systems and the methods of installation most to be recommended for time saving and effective work, are matters with which every contractor should be familiar. The information contained in this article and the one to follow is based upon the very latest practice of one of the large manufacturers of telephonic apparatus and accessories and should prove of value not only to the electrical contractor engaged in private practice, but to those entering the government Signal Service. The author is in constant touch with actual problems as they present themselves to the man in the field and his discussion of these difficulties should prove of particular value.—The Editor.)

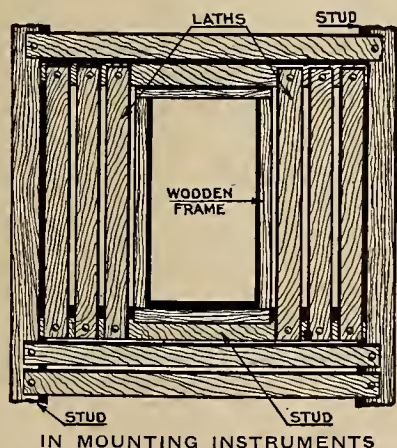
INSTALLATION OF CABLES FOR INTERIOR TELEPHONE SYSTEMS

To insure satisfactory and continuous service of intercommunicating telephone systems, the apparatus and materials should be carefully selected and the installation work carefully done. No matter how excellent the apparatus may be, there is likely to be constant operating trouble and expense for repairs unless the complete installation is done in a thoroughly workmanlike manner, with all connections properly and securely made.

In this article and the one to follow it is assumed that cable will be used throughout the system. The use of cable instead of loose wires is strongly advised in practically every installation except in those cases where less than a total of four wires is employed. The first cost of cable may slightly exceed that of open wire work, but this will be more than offset by the saving in time required for installing cable and the superior and more reliable service obtained.

General Lay-Out of a System

Before beginning the actual work of installation, the exact location of the various telephone stations and cable terminal boxes should be definitely deter-

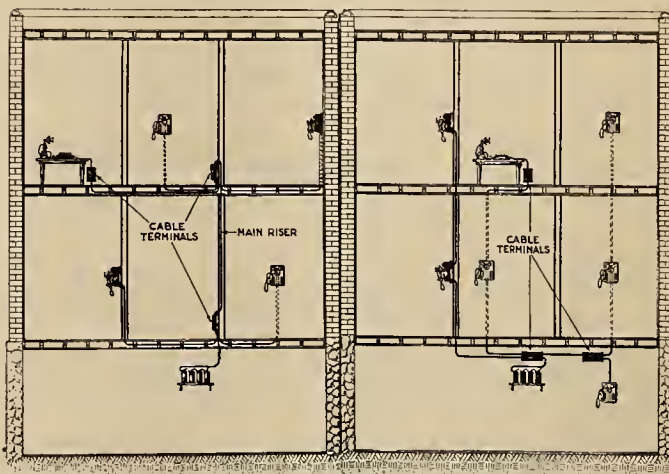


A wooden frame for use with the flush type sets, showing the mounting—Figure 1

mined. Not more than four cables should terminate in each terminal box. This will be apparent from the description of standard terminal boxes to be given later.

Telephones should never be located where they may become injured by a door or furniture, nor placed in the way of passing persons, over radiators, on damp walls or vibrating partitions. Avoid locating them in noisy places, close to windows that are likely to be open in rainy weather or in dark places where it will

be difficult to find the correct push button. Where flush type telephone sets are to be used, the outlet boxes, though part of the set, are detachable and can be installed while the building is under construction. The fronts containing the working parts can be attached later. Wooden frames are recommended for use in connection with flush type sets and can best be mounted as shown in Fig. 1. Where non-flush sets are to be used, the walls must be completely finished before the instruments can be mounted. Wall sets should be so mounted that the center of the transmitter will be about 4 feet 10 inches above the floor; a convenient height for the average person.



SCHEME FOR CABLE CONNECTIONS

Two methods of running the cable to the instruments. The use of terminal boxes on each floor is shown in Figure 2 on the left, whereas separate cables run from the terminal box in the basement in the second method, as shown in Figure 3 on the right.

Character of Cable

For interior wiring where no dampness is ever present and where wiring will not be exposed to view, cable with outside braiding treated with gray fireproof paint is recommended. When the wiring is exposed to view, as in connection with hand sets and desk stands, cable with green glazed cotton braiding is standard and is recommended. For wiring inside a building where there is apt to be moisture even in a small degree, and for all outside wiring, lead covered cable should always be used.

In order to identify the various conductors of a cable, at any point, a method of testing and tagging each wire is sometimes used. This practice, however, consumes considerable time and labor and can by no means be considered absolutely reliable. In order to simplify the work of making connections and at the same time assure accuracy it is better to use cable made up with the various conductors covered with insulation of different colors. With this arrangement any wire in the cable can be readily identified at any point without testing. This method is now standard for all telephone and telegraph work.

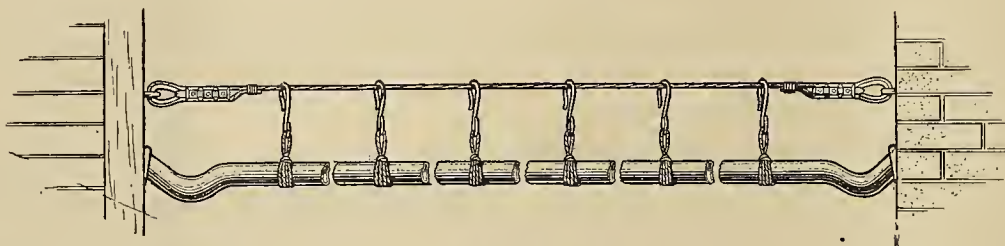
When only single conductors are obtained in a cable, the insulation of each conductor is colored differently. Whenever two conductors are paired or twisted together, the color of only one of the two wires changes. The wire which changes color in a pair is usually termed the line wire and the other conductor the mate. Whenever possible splitting a pair should be voided in order to prevent unsatisfactory operation of the transmission circuit of the system.

The various cables for interior telephone systems are available in three different styles as regards the arrangement of conductors making up the cable. One style of cable has single wires only; another has a combination of single wires and pairs, and a third style has all wires paired. All wires are No. 22 B. & S. gauge except battery wires, which are No. 16 B. & S. gauge.

Methods of Running Cable

The manner of installing cable should be definitely determined before beginning the work, and care should be taken to select the best and shortest runs. If an

In non-fireproof buildings cable may be run along picture mouldings, or supported by pipe straps or cable clamps about two feet apart. When using pipe straps, care should be taken to select the proper size for the cable, as cables of various capacities have different diameters. If the pipe straps are too large or too small, the work of installing the cable and adjusting the straps will not only consume more time, but will result in an untidy installation. Pipe straps should be examined for sharp edges and points which might penetrate the cable and injure or short circuit the conditions.



CABLE SUPPORTS

The supporting of the cable between buildings by a messenger wire. Note that this support is securely anchored to either wall. The drip loop insures the rain water dropping off at this joint before entering the building.

exact plan of the building is not available, it will be helpful in determining these points to make a rough sketch.

There are three general methods of running cable to the instruments. In the first method, Fig. 2, the main cable or riser is run from the basement to a terminal box on each floor and from there separate cables to the various telephone stations. In the second method, the main cable is run from the basement to a terminal box on each floor in the same manner as shown in Fig. 2, but instead of running separate cables from these terminal boxes to each station, only one cable is provided. This makes the circuit of all instruments located on the same floor. If more convenient two cables may also be used, each taking in one side of the building. This method, while not requiring as much cable as the others, is somewhat difficult to install and takes more time. In the third method, Fig. 3, separate cables are run from the terminal box in the basement directly to each station in the system, but not more than four cables from any one box, as previously stated. In case the stations on the various floors are located one above the other it is only necessary to run risers between the floors.

A modification or combination of the methods described may at times be found more economical or convenient, depending upon conditions. In all cases care should be taken in planning the cable runs so they will be inconspicuous. Running cable under or in contact with water or steam pipes or exposing unprotected cable to possible injury should be avoided. Where it is impossible to avoid crossing or paralleling water or steam pipes, the cable should always be fastened above the pipes. Cable should also be kept away from light or power circuit wires. Where a crossing or parallel run is unavoidable, there should be a separation of not less than 6 inches between wires and cable. If the wires carry alternating current a larger separation is necessary to prevent inductive disturbances in the telephone talking circuit.

Porcelain tubes should be used as bushings for holes in walls through which the cable is to be carried. When cable is run on the face of a wall, on or near the floor, as for instance from floor to wall set, the cable is exposed to mechanical injury and moisture, when the floor is scrubbed, and should always be protected by iron conduit or wood moulding. Lead cable for use inside in fireproof buildings should be run in iron conduit.

When wires are brought outside to connect two separate buildings the lead covered cable should either be supported between the buildings by a messenger wire, Fig. 4, or run underground through conduit. When messenger wire is used, it should be securely anchored to each building. If the run is of any length it should be carefully grounded for protection against lightning, particularly when metal cable hangers are used for holding the cable to the wire. The cable should be bent to form a drip loop just before entering the building, so that rain water will drop off at this point and not follow the cable inside. If the cable is run underground through a pipe, there must be no rough edges on the pipe, as these would be likely to damage the cable sheath when the cable is drawn in.

The cable terminals and connecting blocks shown in connections with Fig. 2 and 3 are designed for use where a junction is to be formed between two, three or four cables as, for example, where an outside lead covered cable is to be connected with an interior cable or wherever a branch is to be taken off the main cable. They should be located in an accessible place, but not exposed to mechanical injury, dampness or excessive vibration. Not over four cables should ever be connected to these cable terminals or connection blocks, as too many wires fastened to a terminal make the connections unreliable.

In the next article instructions will be given for preparing the cable for connection to the terminal or connecting blocks.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(It is not always possible to establish priority claims after many years and failure to apply promptly for a patent on new devices and machinery may bring the electrical manufacturer into the position of being held for infringement of an invention which was made by himself. The protection offered by the Patent Office is the easiest and cheapest form of insurance and a necessity in the life of every manufacturing company. The possible contingencies and their forestalling are here discussed by prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON PATENTS

The term or life of a United States patent is seventeen years, commencing on the date of issuance of the patent. On January 1, 1918, the United States had issued 1,251,547 patents, of which 586,721 were then unexpired. Patents now are issuing at the rate of 40,000 a year, and this rate is constantly on the increase.

The state of California is well to the front in respect to the number of patents issued to its residents in proportion to its population. In the year 1916, California residents received patents in the ratio of 1 patent to every 1,122 of the state's population. In the same year the New York ratio was 1 to 1,302; the Pennsylvania ratio was 1 to 1,985, and the Mississippi ratio was 1 to 16,190. These figures entitle California to lay claim to being a land of invention as well as a land of sunshine, fruit and flowers.

The value of patents is fully recognized by the largest manufacturing concerns of the country, and many of them maintain elaborately equipped experimental and research laboratories and patent departments for the development and protection of new inventions.

To keep abreast of the progress being made in its particular line of industry, it is customary for such a concern to secure, as soon as issued, all patents pertaining to such industry.

Infant industries receive more protection from patents than they do from high tariffs and to such patent protection is due the present wealth and prosperity of some of the greatest manufacturing organizations of the country.

To the manufacturer, the value of patent protection is twofold. After expending thousands, and sometimes hundreds of thousands of dollars, in developing some new type of machine or apparatus, it is absolutely essential for him to secure patent protection thereon in order to enable him to obtain an adequate return on his original investment in such experimental work. Without such protection, he would be compelled to immediately meet the competition of others who, unburdened by the expense of developing the machine, could duplicate it and sell it at a price sufficient to yield them an ordinary profit, but insufficient to yield the developer thereof any return on his development expenditures.

From the manufacturer's standpoint, patents are also a species of insurance against possible litigation. When the manufacture of any new or modified form of machine or device is commenced, it is most important for the manufacturer thereof to carefully consider the possibility of securing patent protection therefor, even though, in his opinion, the exclusive right of mak-

ing the machine may be of little value to him. If he fails to file an application for a patent on such new machine or device he may be confronted with the following and not uncommon situation:

Years after commencing the sale thereof, he is notified that the machine infringes a patent applied for months and possibly a year or more after he first placed the machine on the market. The application for such patent may have been pending in the Patent Office for a number of years and under the law, the validity of the patent is not affected by anything done by the manufacturer after the filing date of the application. To prove that he was the first to make the patented machine, the manufacturer is compelled to prove what he did in that regard prior to the application filing date. If said date be five or six years prior to the time his attention is first called to the patent, the difficulty of making such proof is apparent. The drawings and patterns, used in making his first type of machine, may have been lost; the manufacturer may not be able to locate any of the first machines sold by him and his later machine may differ therefrom in form if not in principle. He is, therefore, confronted with the necessity of basing his proofs on the oral testimony of witnesses attempting to remember the details of construction of a type of machine made years before, and such character of proof is always deemed unsatisfactory and of little weight. The manufacturer, therefore, may be held an infringer of a patent covering a machine which was, in fact, first developed by himself, but which fact he is unable to prove by sufficient evidence.

The foregoing and not unusual predicament could have been avoided by the manufacturer, if he had filed an application for a patent on his machine as soon as the same was perfected.

Such an application would be record evidence of his activities and, in the event of another party filing an application disclosing a similar machine, an interference would be declared by the Patent Office between the applications, and the question of priority of invention be at once determined and the patent be issued to the first inventor. Furthermore, the necessity of proving, in such interference proceeding, that he was the first one to invent the machine, would usually arise very soon after the manufacture and sale of his first machine and, therefore, the manufacturer then would be in a position to produce sufficient proofs of that fact, which, many years thereafter, might not be available to him.

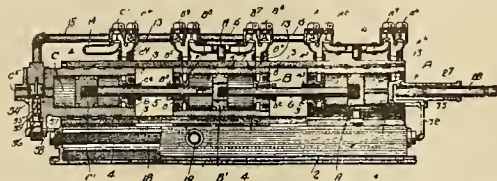
In view of the foregoing, the manufacturer of any new or modified type of machine or device should look

upon the filing of an application for a patent thereon as a form of insurance against infringement suits, and very cheap insurance at that.

NEW IDEAS FROM THE WEST

Pressure Transformer

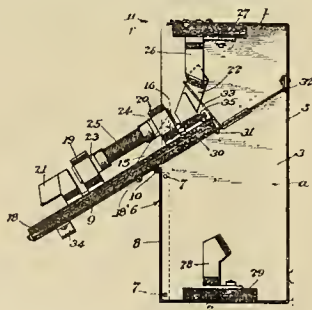
Patent No. 1,253,718, issued to George A. Peterson of Oakland, California, discloses a novel form of apparatus for transforming hydraulic pressure. The apparatus consists of a plurality of aligned cylinders rigidly secured together. Disposed in each cylinder is a piston and the pistons are all rigidly connected together by a piston rod extending through all of the cylinders. Each cylinder end is provided with an



inlet pipe and an exhaust pipe and valves are provided for controlling the inlet and outflow of water from the two cylinder ends. The valves are operated successively by cams secured to a rotatable cam shaft. Water from a tank or water main is introduced into one end of the cylinders and the water discharged from the other end is conducted to the press or other device in which the pressure is desired. A gradually increasing pressure at the press is produced by successively increasing the number of cylinders into which the power water is fed and then gradually decreasing the number of cylinders from which the pressure water is taken. At the beginning of the operation power water is introduced into one cylinder and pressure water taken from all of the others, resulting in low pressure water, and at the end of the operation power water is introduced into corresponding ends of all of the cylinders and the pressure water is taken from one cylinder only, the pressure ends of the other cylinders being open. This produces water under high pressure.

Circuit Breaker

Patent No. 1,253,761, issued to Richard Wolfsberg and Sidney C. Smith of Los Angeles, California, shows a safety circuit breaker. The circuit breaker consists of a case having contacts therein at the top and bottom and a door hinged intermediate, its ends to the front wall of the case at about



the vertical center of the front wall. The door carries contacts on its inside surface, which engage the contacts in the case and close the circuit when the door is closed. When the door is pulled open the circuit is broken. Means are provided for holding the door in a slanting position when it is open, and secured to the inner end of the door is a shield which contacts with the rear of the case, closing the bottom portion of the case.

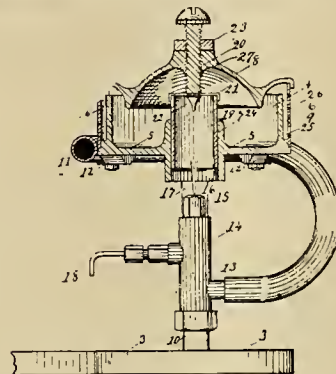
Indicator Reversing Means

Patent No. 1,253,388, issued to Orlando E. Kellum and Arthur H. Sweetland of Los Angeles, California, shows an indicator reversing mechanism for street cars. The indicator reversing mechanism includes an electro-magnetic field magnet and a bi-polar armature. Mechanical means are provided for normally holding the armature with either of its poles

initially inclined toward one of the field magnet poles, and electro-magnetic means are provided for operating the mechanical means, to shift the armature from one normal position to the other. Cooperating with the electro-magnetic means is a mechanism which operates to cause a single operation of the indicator-actuating mechanism when the armature is shifted from one position to the other, and this mechanism includes a switch which is closed by the movement of the mechanical means and opened by a movement of the armature.

Regulator for Oil-Gas Burners

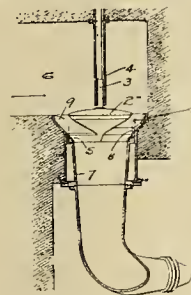
Patent No. 1,253,578, issued to Charles E. Crane of Seattle, Washington, shows a regulator for oil-gas burners. The regulator consists of a mixing chamber having a vertical centrally disposed intake tube and a cylindrical outer wall. Surrounding and spaced from the outer wall is a perforated cylindrical wall which forms the burner, and this burner extends above the cylindrical outer wall. Secured to the outer wall is a dome-shaped cap which deflects the oil downwardly



into the mixing chamber, after it enters through the tube. The oil is sprayed through the tube from a nozzle and the tube is formed telescopically, so that the distance between the upper end thereof and the cap can be adjusted, to vary the amount of air entering the mixing chamber with the oil spray.

Hydraulic Valve

Patent No. 1,253,013, issued to William A. Doble of San Francisco, California, and assigned to the Pelton Water Wheel Company of San Francisco, discloses a novel form of needle valve for controlling the flow of water. Much difficulty has been experienced in valves of this nature due to the intense vibration of the valve when it is moved to a position adjacent the valve seat. The flow of water past the valve pro-



duced vibrations in the valve structure which resulted in the fracture of the valve stem, even when the stem was made excessively large. The object of the present invention is to prevent the vibration of the valve, and this is accomplished by providing means for causing the water to exert unequal pressures on the valve in a direction transverse to its line of movement.

The means employed consists of a semi-cylindrical wall of less height than the stroke of the valve, which springs upward directly from the valve seat. In its initial unseating and final seating movements, the valve is in sliding contact with the wall, so that water flows past the valve on one side only.

SPARKS—Current Facts, Figures and Fancy

(Stimulating the traffic on a city street car system by a lottery on fare receipts is a strictly South American system. In Japan they encourage the electrical industry by a trade exhibit. According to recent reports on the telephone situation, the United States needs no added impetus, for it possesses more than twice as many telephones as all of Europe put together, besides capturing another world's record in the recent boring of the deepest well yet sunk.—The Editor.)

Europe had four million odd telephones and the United States something over eleven millions at the close of 1917. All of Asia is reported as having 340,000 and Africa about 66,000. North America alone, indeed, contains nearly three-fourths of all the telephones in the world.

* * *

Flood lighting a fire seems hardly necessary, but this method was used to help the firemen fight the flames in the recent conflagration at an electric company's plant in New York state. The flood lighting was an improvised affair by the company employees, but materially aided the fire fighters in their work.

* * *

Pay as you enter and you may win a \$150 prize in the lottery as run by the street car system of Lima, Peru. Numbered paper slips are given in exchange for the fare, and these are equivalent to tickets in the semi-monthly drawing conducted by the street car company. The scheme is intended to encourage riding on the street cars.

* * *

Conservation of telephone calls is the most recent article on the "hooverized" list. A Fort Wayne telephone company has asked the public to eliminate all unnecessary calls and to shorten social "visiting," as a war measure, in order that the increased business calls of war times may be handled by a force crippled by shortages of labor and materials.

* * *

Trouble from leaving the telephones in circuit on a patrol line has been obviated by a Western power company by a simple arrangement by which the telephone is automatically disconnected with the closing of the cabinet door. A "baby" knife switch mounted on the inside of the cabinet is struck by a wooden lug fastened to the door—and the telephone thus cut off.

* * *

A novel method of economizing on deliveries has been worked out by a Kansas grocery store which lends customers a small wagon for hauling home purchases too bulky to be carried. These are home-made from scrap lumber and canned goods boxes and cost about 25 cents. The novelty of the idea seems to please the customers, who enjoy trundling home their express wagons.

* * *

We may yet set our clocks an hour ahead for the summer months. The Daylight Saving Bill has already passed the Senate and has been favorably reported to the House. The bill is being advocated as saving electricity as well as daylight. It has been estimated that fifteen million tons of coal now used for lighting through gas and electricity would be saved through this plan.

The deepest well in the world, already 7,363 feet deep, is now being drilled near Clarksburg, in northern West Virginia, in search of deeper oil sands than have yet been reached in this part of the country. This is already 13 feet deeper than the previous record, which had been held by a boring in Silesia. This well goes half a mile deeper into the earth than the Grand Canyon, and the drilling is still in progress.

* * *

An exhibition of electrical machinery and appliances will be opened at Tokio on March 20, 1918, under the auspices of the Nippon Denki Kyokwai (Japanese Electric Association). The manufacture of electrical machinery and appliances in Japan has undergone great development during recent years, and the object of this exhibition is to show the progress that has taken place, and to give a stimulus to further enterprises. Only Japanese manufactures will be shown.

* * *

It is reported that the French army has recently introduced a novel form of miniature searchlight operated by electricity and equipped with a telescope. When in use the searchlight is held in the hands of the operator, so as to bring the telescope into sighting position. The searchlight is aimed at the aircraft with which communication is to be established and maintained, and the operator then sends the messages by means of a tapping key on the side, causing long and short flashes of light to spell out the words or numerals in the telegraph code used.

* * *

An ingeniously constructed small electric mouth light for use by dentists, together with a potential reducer for use with it so that the light can be connected to any lighting socket of 110 volt alternating or direct current, is now offered the trade. The light and the ordinary type of mirror used by dentists is combined in such a way that it can be used in the same manner that the mirror is ordinarily employed.

* * *

"Clipping" of gold coins is now done by electrolysis, the government has discovered — and they have invented an electric machine to detect the light coins thus produced by way of compensation. In the coin detector the coins are pushed in succession from the balance pan on to a knife edge, and according as this knife edge is at the right-hand limit of its range or the left-hand limit, the coin, when pushed on it, tilts to the "light" channel or to the "full weight" channel, as the case may be. The right or left position of this shifting knife edge is determined by an electric contact made by the balance beam, and thus an electromagnet is brought into action.

PERSONALS

W. W. Briggs, formerly general agent for the Great Western Power Company, has left San Francisco for New



York City, where he has accepted an executive position with the Westinghouse Lamp Company. Before leaving San Francisco, a beautiful luncheon was tendered Mr. Briggs at the San Francisco Engineers' Club on Thursday, February 28, 1918. Mr. Briggs has long been an active and energetic member of the club which he has served as its president in past years. In the impromptu remarks that followed the luncheon, emphatic expression was given by

various engineers of the Bay Region to Mr. Briggs' effective work in the West and the hope expressed that his departure to the East may prove but temporary.

Dr. Robert C. Coltman, an official of the Standard Oil at Peking, is a recent San Francisco visitor.

Harvey Boomer, manager of the Jobbers Supply Company, Minneapolis, called on electrical men at Seattle recently.

W. A. Thompson, of the Federal Sign System (Electric) has returned to San Francisco after a successful month's business trip to Arizona.

C. W. Chestnut, sales manager Western Electric Company, Seattle, recently spent a week looking after business on the Olympic peninsula.

Howard R. Sargent, managing engineer of the wiring supplies department of the General Electric Company, is a recent San Francisco visitor.

A. G. A. Van Elde, a consulting engineer from Amsterdam, passed through San Francisco recently on his way to Java to develop water power sites.

W. S. Rugg, manager of the railway department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, is a San Francisco visitor.

Chas. A. Watts, formerly with D. Dorward, Jr., consulting engineer, has established an office as mechanical engineer at 24 California street, San Francisco.

H. R. Stevens, of Stevens & Rockwell, consulting electrical engineers, Seattle, has been made electrical engineer for Stone & Webster for the Northwest district.

Harry Byrne, manager of the North Coast Electric Company, Seattle, has returned from a ten-day business trip, visiting New York and other cities while away.

Tracy Bibbins, president of the Pacific States Electric Company, has returned to San Francisco after a hurry trip to Schenectady, N. Y., and other Eastern points.

Samuel Insull, president of the Commonwealth Edison Company of Chicago, a well-known national figure in utility life, is expected in San Francisco March 21, 1918.

Herbert J. Baker, who until recently was manufacturer's agent for electrical equipment in Denver, is now electrical and mechanical engineer for the Evergreen Mines Co., at Apex, Colo.

Lyle G. Fear, sales engineer with the Westinghouse Electric & Manufacturing Company at Portland, has been elected an associate member of the American Institute of Electrical Engineers.

J. R. Tomlinson of Portland has received the appointment as a member of the National Chamber of Commerce representing the National Association of Electrical Contractors and Dealers.

Daniel Gallick, of the publishing staff of the Journal of Electricity, is the latest contribution of the Journal of Electricity to the national service. Mr. Gallick is with the 319th Engineers at Camp Fremont.

H. D. Carr, designer with the Braden Copper Company, Rancagua, Chile, and Y. Nakamura of Yamaguchi-ken, Japan, are two new Pacific associate members of the American Institute of Electrical Engineers.

F. B. Caswell and R. A. Stranahan, executives of the Chicago, Milwaukee & St. Paul Railroad, are recent San Francisco visitors. The Milwaukee road is the first to electrify its lines over the continental mountain passes.

George I. Plummer recently resigned as superintendent of transportation of the Dallas Railway Company of Dallas, Texas, and has enlisted in the supply department of the United States Army, being located at San Diego, Cal.

B. A. Plimpton, sales manager of the Locke Insulator Manufacturing Company, Rochester, N. Y., is a recent San Francisco visitor, and Walter Goddard, electrical engineer for the company, is expected in this city at an early date.

J. R. Lowe, formerly assistant engineer of the Pacific Electric Railway Company of Los Angeles, Cal., has been appointed superintendent and assistant chief engineer of the San Diego & Arizona Railway, with headquarters at San Diego, Cal.

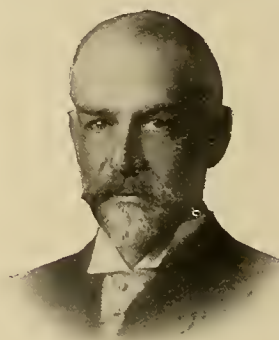
W. C. Davidson, treasurer of the Spokane & Inland Empire Railroad, the United Railways, The Oregon Electric Railway of Portland, Ore., and affiliated lines, will hereafter act as tax agent, and all tax matters of the company will be under his jurisdiction.

E. E. Nash, of the Peerless Electric Company and the Peerless Lamp Company, will arrive in San Francisco Wednesday, after having spent several weeks in Los Angeles. Mr. Nash is on an extended business trip in connection with the interests of his companies.

Professor O. F. Stafford, head of the department of chemistry at the University of Oregon, recently gave a talk on "The Possibilities and Impossibilities of Electrical Application to Chemical and Metallurgical Industries of Oregon" before the City Club at Portland.

H. C. Henry, who was named on the committee of the United States Chamber of Commerce to frame legislation with Congress to unlock the vast water possibilities of the nation, was in San Francisco recently on his way home. He said that it seemed assured that Congress would act at this session.

W. F. Durand, professor of mechanical engineering at Leland Stanford Junior University, has arrived safely in



France, after a voyage of 18 days, according to word recently received by his friends at Palo Alto. For years Professor Durand's work as head of the mechanical engineering department at Stanford has proven most effective in training young men for technical careers, and now his service to the government as head of the United States Aeronautical Board is effectively helping to give to the nation at large a weapon to blind the eyes of the

enemy in the coming months that will undoubtedly prove one of the determining factors in demonstrating the superiority of American genius in its fight for democracy and the freedom of small nations. The arrival in England is announced of delegates from all the allied countries for conference on international standards, at which a standardization of manufacturing materials as related to the production of machinery, motors and aircraft, will be considered. Among the list of distinguished Americans to attend this conference appears the name of W. F. Durand.

E. C. Jones, for many years chief gas engineer for the Pacific Gas & Electric Company, has recently had his duties vastly enlarged. In his extended duties, Mr. Jones has full authority over the gas department in all its branches. Mr. Jones has long been an eminent authority in gas manufacture, and his broadened responsibilities insures increased economy as well as increased efficiency in operation. All well wishers of the West take unusual interest in the continued progress of Mr. Jones, due to his ever having shown such a beautiful spirit of helpfulness to others

as witnessed by his lectures on gas engineering before the students at the University of California and in countless other ways.

A. E. Garland of the Garland-Affolter Engineering Company, is leaving for Los Angeles this week.

Leon B. Jones, the son and able assistant of the chief gas engineer, has recently returned from Washington, where he has rendered valuable assistance to the government upon the subject of tulou.

Max Loewenthal, of the Panama Lamp & Commercial Co., San Francisco, has returned from an extended trip through the Northwestern and Inter-mountain territory in the interest of his firm and reports a growing demand for electrical home appliances.

W. C. Swisher, supervisor of safety of the Denver Tramway Company of Denver, Colo., has left this company to take up the position of general claims attorney for the Kansas City Railways Company of Kansas City, Mo. Mr. Swisher entered the employ of the Denver Tramway Company in June, 1910.

Terrell Croft, the well-known electrical engineer and author of many books on electrical engineering, has joined the Luminous Unit Company of St. Louis, Mo., as its chief electrical engineer. This company is to be congratulated on securing the services of so able an engineer as Mr. Croft.

H. A. Lemmon, sales manager of the Truckee River General Electric Company at Reno, has been made food administrator of Nevada, succeeding Henry M. Hoyt, resigned on account of illness. Mr. Lemmon is secretary of the State Council of Defense. He will give his entire time as a volunteer to war work.

E. F. Bauer of Anchorage, resident engineer of the Alaska Railway Commission, is visiting in Seattle. This is the first time in three years he has been out from the interior. At a luncheon given Mr. Bauer at the Engineers' Club he said that he had sent in his application for a position on Colonel Mears' Engineer Corps and hoped to be called East any time.

J. C. Daries, right-of-way and tax agent of the Oregon Electric Railway Company, the United Railways Company and the Spokane & Inland Empire Railroad Company, of Portland, Ore., has been relieved of his duties as tax agent, but will perform, in addition to his duties as right-of-way agent, the duties of sales manager of the Ruth Realty Company.

E. P. Morphy, treasurer and assistant secretary of the Southern California Telephone Company, Los Angeles, Cal., has severed his connection with that company and is now comptroller of the Los Angeles Shipbuilding & Drydock Company at San Pedro, Cal. Mr. Morphy was formerly secretary and auditor of the Home Telephone & Telegraph Company of Los Angeles.

Alexander McAdie, formerly for years head of the Pacific Coast Division of the U. S. Weather Bureau at San Francisco, and well known to men of the electrical industry in this section, has been made lieutenant commander of the United States Navy in charge of naval aeronautics. In recent years

Mr. McAdie has been professor of meteorology at Harvard University, where he has rendered distinguished scientific service.

Charles H. Lee, formerly consulting civil and hydraulic engineer of Los Angeles, is now a first lieutenant in a water supply regiment of the American Expeditionary Force in France. His address is: First Lieut. Chas H. Lee, Engrs., U. S. R., care Chief Engineer Officer, Water Supply Section, A. E. F., Military P. O. 706, France.

Harris J. Ryan, professor of electrical engineering at Stanford University, is busily engaged in investigating the controlling factors in the durability of suspension-type insulators. This research effort, which is of such timely value in the West, has involved much routine work, the handling of large amounts of material, and the making of many observations. Much good is anticipated by men of the electrical industry from this excellent investigation.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, is at Washington, D. C., where he has gone to present data before the governmental authorities showing the necessity for immediate action looking toward unlocking the great water power resources of the nation. While in Washington, Mr. Britton, as head of the local Red Cross, will confer with national leaders in regard to the new big Red Cross drive set for the month of May.

Loyall A. Osborne of New York, vice president of the Westinghouse Electric & Manufacturing Company and chairman of the executive committee of the National Industrial Conference Board, has been appointed by the Secretary of Labor a member of a committee on industrial peace during the war. This committee, which consists of five representatives of employers, five labor leaders and two public men, will provide a definite labor program in order that there may be industrial peace during the war, thus preventing interruption of industrial production vital to the war.

Chas. T. Phillips, consulting engineer, San Francisco, gave an interesting and instructive talk recently before a convention of municipal officials at Santa Rosa, on the subject of scientific street lighting. Mr. Phillips stated that too much dependence was placed upon what had been done in the past and not enough consideration was given to what could be done by modern methods and appliances. The cities on the Pacific Coast should lead the country in street lighting because the cost of electrical energy is low and the West is the pioneer in the use of electricity on a large scale.

E. B. Walthall, assistant general manager of the San Joaquin Light & Power Company, is busily engaged in these

pre-convention days, in contributing his bit to the excellent paper on retail merchandising to be presented at the Del Monte convention of the Pacific Coast Section, N. E. L. A. The commercial section recently held a meeting at Mr. Walthall's home city, Fresno. No one knows where he got his inspiration for his effective work at that time except a representative of the Journal of Electricity, who snapped Mr. Walthall's picture, which shows Mr. Walthall standing to the right in the view, inhaling inspiration from the famous lines of "Hot Stuff Alley," so-named because bordering the narrow roadway exhibited are 3 telephone circuits,



1 eleven thousand, 2 thirty thousand and 2 sixty thousand volt lines of the San Joaquin Light & Power Company.



The all-enticing golf links—the safety valve for pent-up enthusiasm at the forthcoming convention

THE WAR SERVICE CONVENTION AT DEL MONTE

All is in readiness for the Del Monte convention, Pacific Coast Section N. E. L. A., April 24-27. The four days and nights will be crowded with business, with just enough relaxation to relieve the mind. For this is to be a war-time convention, grappling with the serious problems that now confront the electrical industry. Every paper has been prepared with this end in view and the views of every man are wanted in discussing the solutions proposed.

As this is to be the one big meeting of the year in the West, a record-breaking attendance is anticipated. The California Association of Electrical Contractors and Dealers will hold their annual convention the day before the Pacific Coast Section N. E. L. A. and will then attend the sessions of the latter. The Pacific Coast Electrical Supply Jobbers' Association will likewise hold a prior meeting and then participate in the end-of-the-week activities. The California Association of Electrical Inspectors will also meet at the same time and place. Representatives are to be present from the Northwest and from the East. Everybody who is anybody will be there.

President H. F. Jackson has appointed able committees, who have been hard at work for three months completing all arrangements. Del Monte was selected as the meeting place because of its accessibility, freedom from distraction and the excellent accommodations afforded. Special railroad and hotel rates will be in force.

As these forms go to press a final meeting of the executive committee is being held at Los Angeles on March 15 to approve all plans and papers. Pending their action certain tentative announcements can be made at this time. All papers will be published in the April 1st and 15th issues of the Journal of Electricity and thus allow ample time for preparation of discussion on the part of members of the association and obviate the reading of papers at the meeting.

Commercial Committee

Chairman R. M. Alvord called a meeting of this committee at Fresno, California, March 1st to pass on all papers. Only five papers will be presented, but these deal definitely with the most important present features of the electrical business in the West.

A sub-committee consisting of G. B. McLean, W. L. Berry, C. M. Einhart, H. J. Kister and Miles F. Steel have prepared a paper entitled "Bricks Without Straw," the getting of business without costly extensions, which discusses ways and means for increasing business on existing lines.

"Retail Selling Practice" is the title of an exhaustive paper written by L. H. Newbert, H. L. Aller, H. A. Lemmon, M. L. Scobey and E. B. Criddle. This is a selling manual for the use of central stations or dealers operating retail stores. It goes into every detail of electrical merchandising, including sales arguments, store and window display, and advertising. It will be supplemented by moving pictures showing approved selling methods.

"Industrial Heating" is the subject of a paper by A. E. Holloway, J. B. Black and C. B. Walthal, to be published but not discussed.

A paper is to be presented from the dealers' side by a committee from the California Association of Electrical Contractors and Dealers and from the jobbers' standpoint by the Pacific Coast Electrical Supply Jobbers' Association.

Engineering Committee

Chairman J. E. Woolbridge held meetings of his committee at San Francisco and Los Angeles on March 4th and 5th, when all papers and reports were reviewed. The committee report will summarize the work of the past year as given in more detail in the papers and sub-committee reports.

Fred H. Fowler, electrical engineer for the Forest Service at San Francisco, will analyze proposed hydro-electric developments increasing the power supply. This will be concerned with stream flow data in the Sierra Nevada Mountains, Arizona and New Mexico. It will be illustrated by lantern slides. H. A. Barre will present a complementary paper on "Conservation of Power Resources in Southern California."

J. P. Jollyman will read a paper on "Interconnection of Transmission Systems," discussing the subject both technically and practically.

"Increasing the Efficiency of Steam and Hydro Plants" is a report summarizing the answers to questionnaire calling for a searching examination of existing plants. This includes a paper by E. C. Hutchinson on "Waterwheels," one by R. J. C. Wood on "Power Plant Losses" and one by R. E. Cunningham on "Losses in a Transmission and Distribution System."

R. C. Powell has an excellent paper on "Iron and Steel Conductors," which is by far the most useful that has yet been written on this subject.

"Standardization of Pin Type Insulators," "Substitutes for Cedar Poles" and "Insulator Tests" are the subjects of sub-committee reports.

Enchanting
scenery
on
all
sides
at
Del Monte



Accounting Committee

Chairman C. P. Staal and the other members of his committee have valuable suggestions for the revision of accounting practice of public utilities. This report will be presented immediately after the opening session on Wednesday afternoon.

Public Policy Committee

This report will trace the legislative and judicial developments of the past year and outline approved procedure to meet the pressing problems of these strenuous times.

Membership Committee

Under the direction of W. L. McKinley this committee is active in increasing the membership of the association. It has been especially successful in securing large Class D representation.

Convention Committee

General Chairman Robert Sibley has divided up the work of convention detail by assigning definite responsibilities to each committeeman, who in turn is to act as chairman of a committee to handle the work assigned. These appointments are as follows:

1. Entertainment, R. E. Fisher.
2. Reception, R. F. Behan.
3. Program, J. W. Redpath.
4. Finance, M. A. DeLew.
5. Banquet, T. E. Bibbins.
6. Out-of-Door Sports, W. S. Berry.
7. Registration and Attendance, H. P. Pitts.
8. Automobile, H. C. Reid.
9. Transportation and Hotel, W. M. Deming.

A. B. West, E. R. Northmore, W. L. Frost and H. H. Jones, the Southern California representatives on the committee, are working in harmony with the general scheme outlined above, but serving with especial reference to convention committee activities in Southern California. A convention committee meeting was held in Los Angeles Wednesday, March 13th, at which time complete organization was effected.

Besides the working out of a masterful scheme of transportation and hotel accommodations under the direction of W. M. Deming, by means of which much of the confusion and loss of time occasioned at previous gatherings will be avoided, the committee has in the planning a series of entertainment feats and get-togethers that will make this occasion for the men and women who attend one long to be remem-

bered in the annals of the West, now so famous as a place where man-to-man-fellowship is enjoyed to such a high degree.



Quiet walks for "twos-ing" parties

MEETING NOTICES FOR ELECTRICAL MEN

(A joint meeting of the engineering societies of the bay region for the purpose of hearing Professor Swain, an important session of the California Co-operative Merchandising Committee at Fresno, and various meetings looking toward the N. E. L. A. convention in April, are among the recent gatherings. Reports of interesting programs come from all sections of the country.—The Editor.)

Joint Meeting of San Francisco Societies

A joint meeting of the local sections of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Institute of Electrical Engineers, and the American Chemical Society, will be held at the Palace Hotel, on Wednesday, March 20, 1918, in honor of Professor George F. Swain, past president of the American Society of Civil Engineers and professor of civil engineering in the Graduate School of Engineering at Harvard and Massachusetts Institute of Technology. An informal dinner will be served at 6:30 p. m. Dr. Benjamin Ide Wheeler, president University of California, will introduce Professor Swain, who brings a message from the East on "National Issues of Today." Other noted engineers will be present as guests.

Alameda County Electrical Club

The Alameda County Electrical Club will hold its regular monthly meeting in the Commercial Club rooms on the top floor of the Hotel Oakland, on March 21, at 12:15 p. m.

Walter Martinez has been appointed chairman of the meeting by President George Drew, and will have Lieutenant R. B. MacPherson of the Radio School of Aeronautics of the University of California, as the principal speaker. Captain Jackson of the National Electric Light Association will also give a short talk.

Great preparations are being made for the largest crowd of the year, and it is hoped that the electrical men from both sides of the bay will be in attendance.

Oregon Society of Engineers

Plans for a club house for the Oregon Society of Engineers were formulated by a committee appointed at a meeting of the organization held recently. Other engineering societies will be invited to merge with this society in the building and use of the club rooms.

Another important measure decided upon at the meeting was the framing of an amendment to the constitution which will allow the formation of chapters in small cities of Oregon. The amendment is to be voted upon at the next meeting of the organization. At present the society is established in Portland, but engineers from all parts of the state are eligible to membership.

The co-operation of other engineer organizations of the city will be sought in an effort to establish an employment bureau for men engaged in the engineering profession.

California Electrical Co-operative Campaign

The advisory committee handling this campaign met in Fresno on Thursday, February 28, there being present;

L. H. Newbert, manager Commercial Department, Pacific Gas & Electric Company, San Francisco, chairman of the committee.

G. E. Arbogast, Southern California Edison Company, Los Angeles, Cal., vice-chairman.

G. B. McLean, Southern California Edison Company, Los Angeles, Cal.

A. E. Wishon, assistant general manager San Joaquin Light & Power Company, Fresno, Cal.

R. M. Alvord, manager supply department, General Electric Company, San Francisco, Cal.

D. E. Harris, sales manager Pacific States Electric Company, San Francisco, Cal.

H. C. Reid, President California Association of Electrical Contractors and Dealers, San Francisco. Pacific Fire Extinguisher Co.

J. W. Redpath, secretary.

E. B. Walthall, sales manager San Joaquin Light & Power Corporation.

Mr. A. L. Spring, field man carrying on the work in the southern section of California, was also present.

The selection of a suitable trademark for the California Association of Electrical Contractors and Dealers was postponed until after the 15th of March, to give several artists time to complete their proposed designs. Preliminary reports presented indicate that the committee will have several designs from which to select. This contest for prizes aggregating \$100 is open to all and the committee would be very glad to have additional trademark suggestions sent to Trademark Editor, California Electrical Co-operative Campaign, 505 Rialto Building, San Francisco, Cal.

Full details of the contest were published in the February 1st issue of the Journal of Electricity.

Mr. W. F. Brainard was employed by the committee to act as field man, and will soon take up the work in the central and section of the state. Mr. Brainard has had considerable selling and merchandising experi-

ence, and it is expected that he will assist materially in securing the results toward which the committee is working.

The support of the committee's work by all men interested in the electrical industry is particularly desired, and to this end the committee proposes to conduct a publicity or educational campaign outlining the objects to be accomplished and the work which the committee proposes to do. A special meeting for this purpose is planned in connection with the work of Mr. Spring, in Los Angeles.

In addition to generally reviewing the excellent report of conditions in the South, as presented by Mr. Spring, and discussing with him the need of further activity, the committee outlined at the Fresno meeting a plan for holding a general get-together meeting of all men in the electrical industry in and around Los Angeles. It is expected to hold this meeting about March 15th, one of the principal speakers to be Mr. Albert Elliot. It is hoped that this meeting will be attended not only by contractors, dealers, jobbers, manufacturers and central station officials, but also by the employees of these different organizations, particularly the commercial employees.

BUILDERS OF THE WEST—XXV



O. B. COLDWELL

The commonwealths of the Northwest have contributed many distinguished educators, executives and engineers to the upbuilding of the West as a whole. In and about Portland, Oregon, there has grown a system of railway, light and power effort that for efficiency and courtesy has established new records in utility service to the public. To O. B. Coldwell, superintendent of the Portland Railway, Light & Power Company, this issue of the Journal of Electricity is affectionately dedicated. And in this dedication account is not only taken of the eminent engineering and executive ability he has displayed, but also for the wealth of good cheer he gives out to all with whom he comes in contact.

Pacific Coast Section Convention Postponed

Owing to the conflict in dates with the closing days of the Liberty Loan Campaign, the Del Monte Convention of the Pacific Coast Section, N. E. L. A. has been postponed. Definite announcement of plans will be made later.

chairman of the membership committee, announced twenty-five new members, while F. E. Bayde of the General Electric Company, chairman of the entertainment committee, has in course of preparation a continuation of the series of helpful programs that have now become such well-established traditions of the League.

San Francisco Section A. S. E. E.

By far the largest and most enthusiastic meeting for the year of the San Francisco Section of the American Institute of Electrical Engineers was that held on the evening of February 28, 1918, at the rooms of the San Francisco Engineers Club. The meeting was bristling with interest due to the discussion of a very timely subject, namely, that of interconnection. The details of the program were announced in the last issue of the Journal of Electricity. On another page of this issue may be found the important features of the paper presented by Mr. P. M. Downing.

Pacific Coast Gas Association

The Pacific Coast Gas Association held its first get-together dinner of the present season at Los Angeles on the evening of Saturday, February 16th. One hundred and fifty-five representatives of the gas industry on the Pacific Coast sat down to an enjoyable feast in the banqueting room of the Hotel Alexandria. Naturally, the local men were most in evidence, but there was a goodly attendance from outside districts. San Francisco was represented among others by John D. Kuster, the association's president, Leon B. Jones, Van E. Britton, M. L. Neely and F. S. Myrtle. Two past presidents from the north attended, Messrs. Frank A. Cressy, Jr., of Modesto, and C. B. Babcock of San Francisco. Expressions of regret at unavoidable absence were received from Messrs. Jno. A. Britton, E. C. Jones and Harry Bostwick, G. P. Eggleston of the Coast Counties Gas and Electric Company, and S. C. Bratton of the Portland Coke and Gas Company.

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"Officers quarters are steam heated. The barracks are heated by hot air. There is installed complete sewer, water, fire protection, and lighting systems. The barracks are 180 feet long, housing 250 men in single bunks. The road system was constructed under separate contracts."

The Oregon Society of Engineers and the local section of the American Society of Civil Engineers were the guests of the Joint Sections (A. I. E. E. and N. E. L. A.). After the paper, light refreshments were served. The attendance was one hundred and twenty-five.

The next joint meeting of the Portland local societies of the A. I. E. E. and N. E. L. A. will be held on April 2, 1918. Mr. J. B. Fisher of Spokane, Wash., will be the speaker of the evening. The subject will be announced later.

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The complete program for the two-day convention of the Electrical Contractors and Dealers, which is to be held in Salt Lake City on April 5th and 6th, is not yet available.

However, some of the features embraced in the program will be a discussion of salesmanship with reference to electric articles, and papers on kindred subjects. On Friday evening, April 5th, a banquet will be given to members and visiting friends of the association. The program will also embrace motion pictures of lamp manufacturing and other electric appliances.

A very cordial invitation is extended to any and all who may be connected with the electrical industry, or who may be passing through en route to the Del Monte convention.

For any further information with reference to the convention, address the secretary, U. S. G. Todd, 604 McIntyre Building.

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San Francisco Engineers' Club

The San Francisco Engineers' Club continues to have lunches and get-togethers that are becoming distinct traditions in the engineering life of the San Francisco Bay region. The local branches of A. S. C. E. and A. S. M. E. hold individual weekly luncheons at the club rooms, as do a number of other local technical organizations. The lunch price is but 60 cents and the service is excellent. On March 12, 1918, Dr. Ludwik Ehrlich, lecturer in political science at the University of California, gave an interesting talk on "America's Peril in Light of Prussian and German History."

The San Francisco Electrical Development League

President R. E. Fisher's initial meeting of the League on March 6, 1918, started off with a zest and enthusiasm that portends much for the future usefulness of this organization in affairs electrical of the San Francisco Bay region.

Amid the Aztec yell for the forthcoming convention of the Pacific Coast Section N. E. L. A., the meeting was called to order. The yell is as follows:

Escalaventa

Escalaventa

Dorienta

Dorienta

Umfada

Umfadade

Umfadade

Del Monte-ul-la-la.

The portion to the right is led by the yell leader, while that to the left is repeated in unison by those giving the yell.

Tracy Simpson, veteran manager of the Federal Sign System (Electric) was then introduced and gave a sketch of the life and work of Nathan A. Bowers, a fellow member and the Western editor of McGraw-Hill Company. The talk proved a scream from start to finish. M. L. Scobey then read a most helpful paper on the jobber situation, which will be found in full on another page of this issue.

George Curtis of the Pacific States Electric Company, chairman of the membership committee, announced twenty-five new members, while F. E. Bayde of the General Electric Company, chairman of the entertainment committee, has in course of preparation a continuation of the series of helpful programs that have now become such well-established traditions of the League.

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Non-Essential Industries in New York

"Non-Essential Industries—How They Can Help Win the War," was the subject discussed at the meeting of the New York Section of the American Society of Mechanical Engineers on Thursday, February 21st. Short, pointed talks by representative men covered such fields as "What Non-Essential Industries Have Done," "What Non-Essential Industries May Do," "What the Government Has Done," and "What the Government May Do." The object of the meeting was to direct the forces of non-essential industries toward winning the war, and non-members were invited to come and express their ideas.

Joint Meeting of Portland Sections of the A. I. E. E. and N. E. L. A.

The joint meeting of the local sections of the A. I. E. E. and N. E. L. A. was held Monday evening, March 4, 1918, at the Multnomah Hotel, Portland, Oregon.

The regular speaker, Mr. Thompson, assistant U. S. engineer in charge of the improvement of the Oregon City locks, was to have given a paper on this subject, but was taken very sick and could not appear. Consequently, it was necessary to arrange for another speaker to take his place, and Mr. Geo. C. Mason, president of the Hurley-Mason Company, offered to give a talk on the construction of Camp Lewis, Pierce county, Wash.

Mr. Mason said in part: "Camp Lewis is located 18 miles from Tacoma, Wash., on a hard-surfaced roadway. Also on the main line of the Northern Pacific Railroad. The site covers 70,000 acres of ground. Work was started July 10, 1917, and the cantonment was complete in eight weeks. Cost, \$7,750,000. Consists of 2000 buildings, housing 54,000 men.

"It is the largest cantonment in the United States, and at times there were as high as 10,000 men employed. The pay roll per week was \$383,000. Eleven miles of railroad tracks were built and 100 motor trucks used. Other material consisted of 60,000,000 feet of lumber, 871,200 feet of weatherproof wire, 1,300,000 feet of rubber covered wire, and 35,550 lamp sockets. All the buildings were built in units. During all the time of construction there was not one serious fire.

"Officers quarters are steam heated. The harracks are heated by hot air. There is installed complete sewer, water, fire protection, and lighting systems. The barracks are 180 feet long, housing 250 men in single bunks. The road system was constructed under separate contracts."

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A very cordial invitation is extended to any and all who may be connected with the electrical industry, or who may be passing through en route to the Del Monte convention.

For any further information with reference to the convention, address the secretary, U. S. G. Todd, 604 McIntyre Building.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.
March 4—E. B. Thompson, "Engineering Features of the Oregon City Locks."

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month. March 15—"Lighting and Illumination."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

President—Col. Robley Stearnes, New Orleans, La.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Directors—California: W. D. Kohlwey, San Francisco. Oregon: Samuel C. Jaggar, Portland.
Next Convention—Cleveland, July 17-20.

British Columbia Ass'n of Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—Allen S. Halls, 517 Railway Exchange Bldg., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next meeting—Del Monte, April 24-27, 1918.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—H. C. Morris.
 Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
 1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
 Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
 Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
 Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
 Secretary—W. C. McWhinney, Southern California Edison Co.
 Meetings—Every Wednesday, 12 m., at Jahnke's Tavern, 524 S. Spring Street.
 March 6—August F. Knudsen, "Hawaii."

San Francisco Electrical Development League

President—R. E. Fisher
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
 Secretary—A. E. Coney, Great Western Power Company.
 Meetings—About every 50 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric Company, Oakland, Cal.
 Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.
 Next meeting—March 21st.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
 Secretary—Chas. H. Delany, 445 Sutter St., San Francisco
 Meetings—Quarterly.
 Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
 Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
 Meetings—Quarterly.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—Orrin E. Stanley, Box 973, Portland, Ore.
 Secretary—C. J. Hogue, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—J. F. Pinson, Seattle, Wash.
 Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
 Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.

President—B. P. Legare, 58 Sutter St., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.
 Annual meeting: October.
 February 26—C. T. Hutchinson, "Employing Technical Men."

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
 Secretary—Ira F. Shaffner, Boise.
 Annual meeting: January.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS**American Ass'n for the Advancement of Science—Pacific Division**

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
 Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
 Meetings—Annual.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.
 March 2—W. P. Schuch, "The Deodorization of Fatty Oils."

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
 Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
 Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Pierson, Roeding & Company Retire

The present management and ownership of Pierson, Roeding & Company are withdrawing from the selling agents field. Their several pleasant relations with the various companies whose accounts they had had and whose products they have sold with great success for many years past are about to be discontinued.

Mr. S. Herbert Lanyon has obtained the Pacific Coast representation of the Federal Signal Company account. Mr. Lanyon has been for many years past connected with Pierson, Roeding & Company as former manager of their Portland office. For the last two and one-half years, approximately, he has been sales manager of the San Francisco office.

The Locke Insulator Mfg. Co. has arranged with the Pacific States Electric Co. to sell Victor Insulators on the Pacific Coast. Mr. H. R. Noack of the Pacific States Electric Company will personally direct the sales policy in the West. As Mr. Noack was formerly president of Pierson, Roeding & Co., he is thoroughly familiar with the insulator situation on the coast.

Mr. Harry S. Whiting, president of Pierson, Roeding & Company, is San Francisco office manager of the Aluminum Company of America, and will devote his energies to the business of that company on the Coast, remaining the president of Pierson, Roeding & Company until its affairs are settled. Mr. Whiting has been with the Aluminum Company of America for fifteen years. He was for many years in their New York office; afterwards was manager of their Philadelphia office, and was manager of their Pittsburgh sales office just prior to coming to the Coast in November, 1915, when he assumed the duties of vice-president of Pierson, Roeding & Company on December 1, 1915. Since June, 1916, he has been president of Pierson, Roeding & Company.

Changes and Beginnings

Northwestern Electric Company, Pittock building, has taken out a permit to erect a \$15,000 building at the foot of Lincoln street. Charles C. Moore & Co. are engineers for the company.

The deal which has been under consideration for several months between James R. Wheeler and Arthur Blanchard of Marshfield and the Gardiner Light & Power Company has been concluded and the Umpqua Power Company organized at Reedsport, Ore., and will take over the first named plant, which will be removed and light furnished to that town from the plant which will be established at Reedsport.

F. M. Lewis and others have incorporated the Water Lift & Power Company at Centralia, Wash., with a view to making and using a propeller type of current water motor, which will operate under pumping machinery to lift water to desert land. Mr. Lewis patented the motor.

Wagner Electric Company, Seattle, has moved its offices from 506 Pacific Electric building to 538 First avenue, south, where more commodious quarters have been fitted up and a new service station established. Increased business necessitated this move. Business with the shipyards has been largely increased. C. Kirk Hillman remains in charge of the offices.

The Westinghouse Electric & Manufacturing Company announces the removal of its office from Phoenix, Ariz., to Tucson, Ariz. Its representatives, Messrs. J. H. Knost and W. G. Willson, will have headquarters in the Immigration building at the latter point.

Personal Items

Captain Richard P. Henry, late of the United States Army, has joined the selling forces of the Square D Company, Detroit, manufacturers of steel enclosed safety switches, and has been appointed to the Indiana territory, with head-

quarters at Indianapolis. Captain Henry was for some time connected with the Santa Susana Syndicate, Los Angeles, in the capacity of engineer and assistant geologist, and later entered the contracting business for himself, with offices at Chicago. He finally enlisted in the Engineering Corps of the United States Army, from which he was recently given an indefinite leave of absence on account of physical disability.

Solution of Seattle Transportation Problem

Solution of the Seattle transportation problem in so far as it relates to workers going to and from their labors in the shipyards, is announced by the King County Council of Defense. The outcome is the result of negotiations between the organization and county and federal authorities, and includes the operation of steam trains along the water front and an additional ferry in the harbor to the West Waterway. It is announced that the plan for steam trains for workmen along East marginal ways, which was approved by the United States Shipbuilding board several weeks ago, has been approved by the director general of railways. This plan was suggested by the special investigating committee of the King County Council of Defense, which investigated the transportation problem of the city after it had carefully considered the matter in connection with meetings of railroad men, operators and workmen. This committee also suggested service by ferry to the West Waterway, and it is planned to have the ferry Washington withdrawn from Lake Washington, same to operate from foot of Columbia street. County commissioners and port commission have each approved this step.

The report further states that following recommendations of the special investigating committee for the immediate improvement of the street car service to the shipyard district, the Puget Sound Traction, Light & Power Company had met the suggestions and carried out the improvements. Definite charges for fares have not been fixed, but as low a rate as is feasible is suggested.

Power Rates Satisfactory

North Coast Power Company, operating at Chehalis, Wash., has filed a new schedule of rates that is satisfactory to the state public service commission. The cut in rates amounts to about 33 1-3 per cent, which became effective February 1st. The new rates are nine cents for the first 40 kilowatt hours and five cents for all over that amount. The former rate was 12 cents for the first 20 kilowatt hours.

Southern California Edison Earnings

The operating statement of the Southern California Edison Company, for the twelve months to December 31 last, shows a gross of \$7,382,337, a decrease of \$780,163, and net operating revenue of \$4,447,694, a decrease of \$357,061. The surplus was \$2,893,773, an increase of \$147,175. Allowing about the same interest charges as were made in 1916 and for the dividend on the preferred stock, the balance, if the depreciation allowances were the same as in 1916, was equivalent to about 12 per cent applicable to the 7 per cent common stock.

Pacific Gas & Electric's Year

The Pacific Gas & Electric Company makes this comparative report for January and the year ended January 31:

January—	1918	1917
Gross operating revenue	\$1,870,133	\$1,773,564
Net earnings	591,820	712,943
Surplus	158,762	282,080
Year—		
Gross operating revenue.....	\$19,909,949	\$18,626,349
Net earnings	6,637,566	7,721,533
Surplus	1,573,277	2,761,935

Electrical Heating in Glendale

With twelve completed heating installations, the entire heating of their office and a number of other installations ordered, the Public Service Department of the city of Glendale reports very favorably on electric heating in their territory.

The sale of heaters was not advised until they had been thoroughly tested, care being taken to place them only in desirable locations. Many more could have been sold with a less careful sales policy.

Three and five kilowatt Hotpoint Heaters of the radiant type are sold, preference being given the 5 kw. size. List prices are maintained, wiring being charged for extra. The department does not do the wiring; it is entirely handled by the local electrical dealers.

They find a consistent usage of the heaters with a considerable diversity. The peak loads are caused by a superimposition of the pumping load upon the ordinary day load so that the tendency of the heaters is entirely to improve the yearly load factor.

Call for Radio Operators

In a communication just received from the office of the Chief Signal Officer, Washington, the University of California is called upon to supply experienced radio (wireless) operators. Men accepted will be ordered in groups of five, it is stated, on detached service of highly confidential nature. Those chosen for this service will be enlisted and ordered at once to Washington. It is an unusual opportunity to start on important work of great interest without any of the customary delays in training camps, the call states. It is the intention of the signal office to draw not upon these students now getting their preliminary training in radio classes, but rather upon those who have had experience as amateurs in private stations and are already proficient radio operators.

Price of Western Coal

Radical alterations in the prices of coal at the Western coal mines are announced by Federal Fuel Administrator Albert E. Schwabacher. The table of new prices officially announced is as follows:

	Run of Mine.	Prepared Sizes.	Screen- ings.
Colorado bituminous coal.....	\$2.70	\$3.95	\$1.70
Colorado bituminous steam coal from Trinidad district...	2.80	3.70	2.10
Colorado lignite coals	2.70	3.70	1.45
Montana, Wyoming and Utah coals	3.10	3.75	1.95

Readjustment of Electricity Rates

Readjustment of electricity rates in Northern California, which will necessitate a physical valuation of the Pacific Gas & Electric and Great Western companies, will be undertaken by the State Railroad Commission, with the initial hearing on March 15. The Universal Electric & Gas Company will also be a party to the proceedings, having been included in the original San Francisco case. A vigorous protest against making industrial activity bear the full burden of the increase sought was made recently by the Bethlehem Company, when officials of the Union Iron Works came to explain that they are building millions of dollars' worth of ships for the United States Government on a cost plus profit basis.

An Irrigation School

The irrigation school held at Redmond, recently, was the first of its kind yet held. A series of lectures on irrigation practice, irrigation laws, irrigation management and engineering, as well as practical field demonstrations, were included. Field demonstrations were given in selecting and laying out land for irrigation, locating laterals by simple leveling instruments, constructing weirs, drops, measuring boxes, flumes and other structures. The entertainment and banquet given by the Redmond Commercial and Ladies' Club fittingly closed the session.

Errata: In the issue of the Journal of Electricity for February 1, 1918, the leading article dealt with the new turbine installation of the White River Plant of the Puget Sound Traction, Light & Power Company under the general title: "The Most Powerful Turbine in the World." This should have read "The Most Powerful High Head Turbine in the World," as there have been installed low head turbines of 31,000 hp. capacity.

LATEST IN EVERYTHING ELECTRICAL

(A pull socket current tap which makes it possible to avoid inserting the hand into a narrow lamp shade for the purpose of attaching a plug to the socket each time an electric appliance is used, a new type of moving picture machine for convention and show window use, and a new duplex Bryant switch and a squirrel cage motor which may be controlled from a distance, are among the recent additions to the field of electrical apparatus.—The Editor.)

Squirrel Cage Motors

The control from a remote point of the starting and stopping of single phase and standard polyphase motors, as well as high torque polyphase motors, is often desirable, if not essential. Such installations in connection with pumps for railroad water tanks, and various other pump and compression applications, coal and ash conveyor installations, etc., are at once called to mind. The control may be a float switch closing and opening the control circuit with changes in the water level of a tank; or a pressure regulator performing similar service in a closed system; or by push button stations, one button being normally open and one normally closed. In any case some form of automatic device must be used (unless the motor is very small) to handle the motor current. The automatic starting switch shown in the accompanying illustration is of the double pole clapper type and is made for a single phase and standard polyphase motors up to 15 horsepower and for high torque polyphase motors up to 50 horsepower. Besides the double pole switch, two inverse time element overload relays are mounted on the same slate panel, which is supported on a press steel frame.

When used with float switch, pressure regulators or snap switch, the overload relays are arranged for manual reset; hence when an overload occurs the operator is required to go to the starting panel before the motor can again be started, a feature which results in more careful attention to operating conditions and lessened abuse of the motor.

When used with three wire controlling apparatus such as two push buttons, one normally open and one normally closed, the overload relays can be furnished with self-resetting feature.

The wiring diagram (Fig. 1) shows the advantages of this feature and why depressing the start button will immediately restart the motor after a shut down from overload trip, voltage failure or intentional stopping with stop button.

A glance at the control circuit diagram shows that depressing the start button closes the circuit to the coil M through the stop button and both overload relay trip contacts. The closing of the main contactor connects the control circuit to the line at H and this holds in the main contactor independent of the start button. The reader will note, therefore, that the control circuit will be broken and the contactor opened if either of the overload relays operate, the stop push button is depressed, or the main contactor opens due to low voltage or other cause.

Except on some of the smaller sizes both poles of the main contactor are equipped with powerful magnetic blow-outs. The clapper switch fingers are standard CH butt contact construction with hard drawn copper tips. By the use

of shading coils these contactors possess great holding power, and a total absence of magnetic hum.

The relays used on these panels are of that type in which the length of time between the instant the overload condition arises and the instant of opening the control circuit is inversely proportional to the amount of the overload. They

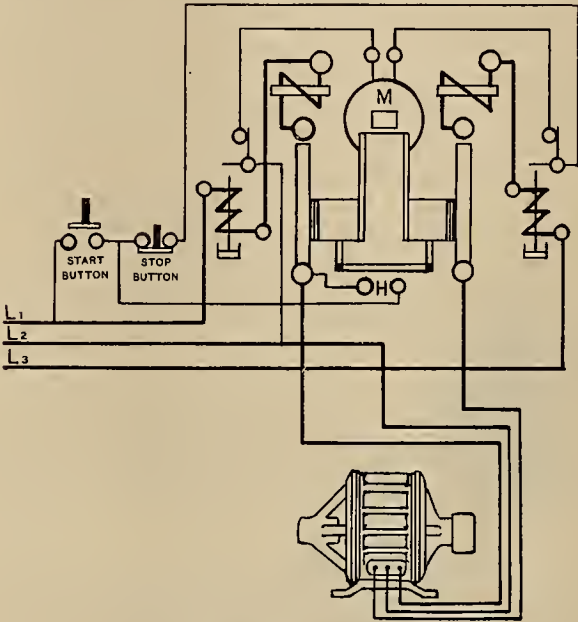


Diagram of connections

give adequate protection to polyphase induction motors against excessive continued overloads and yet permit a large initial inrush of current for starting.

The complete panel is known as the "Across-the-Line Type Self Starter" and is manufactured by the Cutler-Hammer Mfg. Co. at their works in Milwaukee, Wis.

The Attractograph

A new type of moving picture machine for office, convention and show window has been brought out by the Attractograph Company, 220 West Forty-second street, New York City. This machine displays pictures which can be readily seen in broad daylight as well as by night. Its operation is entirely automatic in all its functions. After the reel is projected it is automatically rewound and then displayed again, so that after the machine is arranged and started it will continuously operate for an indefinite period, without any further attention.

The outfit consists of two separate parts, the moving picture machine and miniature theater, in which the pictures are displayed. The moving picture machine will operate on either direct or alternating current. Two horizontal discs carry the film, which passes in one direction for projection and in the opposite direction for rewinding.

A 250 watt Mazda stereopticon lamp furnishes the light, which is automatically extinguished when the machine stops and during the process of rewinding.

The machine is equipped with two automatic safety switches, which are provided for in case the film breaks, in

which event the machine stops and the light goes out, if this occurs while projecting; in case it happens while rewinding the machine simply stops, the light being out.

All parts of the machine are made from an aluminum composition, so that the machine weighs but thirty-five pounds. The machine is very well made, all moving parts running in Norma ball bearings, packed in non-fluid oil, enclosed in dustproof housings, the machine being very substantially built and well constructed.

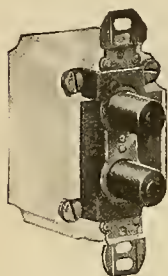
There is a dustproof and soundproof cover provided, which acts as a carrier for the machine as well as a cover.

The moving picture is placed about a foot from the theater, so that the light enters an aperture in the base; here it strikes a mirror set at an angle of 45 degrees and is reflected upwards on to a screen, set on which would be termed a stage. Another 45-degree mirror reflects an image of the screen, making the picture appear to the audience to come from a screen on the rear wall of the theater.

Standard non-inflammable films in lengths of 50 to 500 feet can be exhibited. The outfit draws $2\frac{1}{2}$ amperes and is approved by the National Board of Fire Underwriters.

Bryant Duplex Switch for Single Gang Box

For controlling two independent lighting circuits from one point, the Bryant Electric Company of Bridgeport have designed and added to their line of Perkins duplex flush switches a new switch that can be used as a substitute for two separate single pole flush switches which require a two-gang switch box.



Duplex switch

The new device consists of two of the well-known Perkins Type "O" push button switches mounted in a porcelain cup, each switch having its own line and circuit terminals, so that separate feeds for the two circuits can be brought into the switch.

The switch fits into any shallow single switch box and takes the standard two-button plate; therefore the general appearance is considerably bettered by the use of the smaller plate, and the cost of material used is considerably reduced.

This switch is specially advantageous where the public service company has a two-rate schedule. As the switch has separate feeds, a circuit at each rate can be passed through one box and controlled at the same point.

The new device, which is known as Type O, Duplex Gang switch, No. 2709, is National Electric Code Standard and is rated at 10 amperes, 125 volts—5 amperes, 250 volts.

A Pull Socket Current Tap

The Harvey Hubbell Company is now placing on the market a pull socket current tap. The device is of the same mechanical construction as the ordinary pull socket, to which has been added a plug receptacle built into the side of the body. It can be supplied with a $\frac{1}{8}$ -inch, $\frac{1}{4}$ -inch, $\frac{3}{8}$ -inch or pendant cap.



Pull socket tap

The flow of current to the lamp base is controlled by the pull chain. The terminals of the receptacle are continuously in circuit.

The use of this socket eliminates the annoyance of a long cord running beneath the fixtures to operate the various table electrical appliances now in general use without the necessity of sacrificing the use of the light.

This device will make quick appeal to anyone who has tried to grope into a lamp shade for the purpose of attaching a plug to the socket.

ALIENS IN AMERICAN INDUSTRIES

(Industry faces a grave problem in the unfriendly employee, alien or disloyal citizen. The outline below, gotten out by the National Americanization Committee, indicates a practical method of solving this problem.—The Editor.)

First of all take a census of all employees and divide them into four classes—native born, naturalized citizens, friendly aliens, and alien enemies. If they are naturalized citizens of enemy alien descent they had better be classed industrially with alien enemies until something of their history and record is known. Let us insist frankly that a man born on another soil has to prove himself for America.

Second—Make an analysis of a map of your plant showing its vulnerable spots. Where will a fire do the greatest damage; where is waste accumulated; what hydrant is most vital in extinguishing a fire; where is the control of your lighting system; and how accessible is your surtax bond; where will an explosion cause the most damage; what machines are most vital or difficult to replace; where can goods in transit be tampered with easiest? A dozen other things have already suggested themselves to you. Now find out what kind of workmen are in charge of these vulnerable points. If they are enemy aliens, transfer them at once. Don't wait to have them prove their loyalty.

When fences are put up and windows barred and guards established, do you consult your factory plan to see that every vulnerable part is included, or do you do like one concern in New England—leave your transformer out in a field, fifty feet outside of the fence, where an enemy with a tin can of powder could paralyze your plant?

Lighting is the next important essential. Every possible improvement should be made; vulnerable points should be especially well lighted. Keep alien enemies and persons of doubtful loyalty in the light all of the time.

Keep outsiders out. Verify credentials of visitors. When they get in, see that they go only to the place they are supposed to go. Don't send them alone. Escort them in, stay with them, and escort them out.

One way to keep outsiders out is to reduce your labor turnover. Every time a new man is taken on who is not known, it increases the risk. After the registration of enemy aliens in February, ask every new employee if he has such a registration card.

Permits should be required by employees to go to different parts of the plant. A general tag is not sufficient. An alien enemy in one place may be a low risk; in another a high risk.

Appoint some employee as an aliens captain in the plant and give him a committee if it is advisable. Call him by any preferred name, but give him the whole job of looking after the safety of the plant from the man-power end.

Take a personal interest in the alien. If it is necessary, set up an information bureau to help him understand drafts and regulations and registration. If he wants to learn English and become a citizen, help him to do so. See that he gets American information on bulletin boards, in pay envelopes and otherwise, to offset the anti-American material sent him or told him. (Over 140,000 sets of civic lessons in foreign languages have already been handled by industries through pay envelopes.)

When this intelligent handling of alien enemy and those of doubtful loyalty is in operation, the plant is ready for another step—the systematic removal of every possible cause for unrest, dissatisfaction, disloyalty and disturbance. The man who strikes may think it is bad housing or treatment; the German propagandist knows it's German efficiency playing through American negligence and carelessness.

The American government cannot protect the plant that will not protect itself, and the invisible war being carried on in American industries must be won by American manufacturers or the visible war in Europe will be lost.

NEW ELECTRICAL DEVELOPMENTS

(On April 2d the proposition of buying the street railway system is to be put before the voters of Tacoma, together with a proposition for a five million dollar power plant. The tying-in of transmission lines as a method of war saving continues down the coast. Activities for the two weeks period on the whole are normal, although a policy of retrenchment is being carried out by big power interests in the Pacific Central District.—The Editor.)

THE PACIFIC NORTHWEST

LA GRANDE, WASH.—Preparations are being made by the American Nitrogen Products Company for the installation of three electric ovens at its plant.

ROSEBURG, ORE.—Pacific Telephone & Telegraph Company contemplates reconstruction of its lines along the Pacific highway in Douglas County.

POULSBO, WASH.—A franchise for transmission and electric lines was granted to the Puget Sound Pulp and Power Company for a term of twenty-five years.

CHEHALIS, WASH.—City commission has decided to submit to vote on April 20 the question of granting a power and light franchise to O. E. Anderson of Portland.

WALLA WALLA, WASH.—L. A. McArthur, speaking for the Pacific Power & Light Company, announces that the local light service is to be greatly improved in the near future.

SEATTLE, WASH.—Puget Sound Traction, Light & Power Company has permit to erect coal bunkers at 1316 Western avenue, to cost \$17,000. Stone & Webster, 868 Stewart street, builders.

POMEROY, WASH.—The city council is considering an application of the Pacific Power & Light Company for a franchise to supply electricity for lamps and motors in Pomeroy for a period of fifty years.

SPOKANE, WASH.—Contract, it is understood, has been awarded by the Washington Water Power Company for a third generator (22,500 horsepower) for its Long Lake plant to the General Electric Company.

BELLINGHAM, WASH.—The Puget Sound Traction, Light & Power Company is contemplating the erection of an electric transmission line to the Cokedale mine to furnish 500 horsepower to the plant there.

EPHRATA, WASH.—The Intermountain Power Company has petitioned the commissioners of Grant County for a franchise to construct and operate an electric transmission line over certain highways in Grant County.

SEATTLE, WASH.—Finance committee of the city council recommends the expenditure of about \$6000 to secure information with reference to the Ruby canyon power site, where the city proposes to erect a large plant.

FERNDALE, WASH.—The British Electric Company, it is reported, is considering extending its electricity here for lamps and motors. The company also proposes to furnish electrical service to farmers in the Glendale district.

STEILACOOM, WASH.—The installation of a municipal water works system is under consideration in connection with lighting plant. A 12½ horsepower electrically operated pump has been purchased for same. R. F. Gleason is electrician.

TACOMA, WASH.—Plans are under way for the city to furnish its own electricity to operate the municipal car line across the tide flats. Plans are being made by the city electrical department for construction of a substation on the tide flats line.

TACOMA, WASH.—An ordinance is being prepared under the direction of H. F. Gronen, commissioner of the light and water department, which will be submitted to the voters at the election to be held on April 2, asking their opinion on the purchase of a \$5,000,000 power plant for the city of Tacoma.

MARSHFIELD, ORE.—Arrangements are being made by the C. A. Smith Lumber Company to install additional electric equipment to double the output of its mill. Machinery costing about \$80,000 for the second unit, it is reported, has been ordered.

CHEHALIS, WASH.—Central Light & Power Manufacturing Company has filed a petition with Lewis County commissioners for franchise to construct and operate electric light and power line between Walville and Meskill, a distance of twelve miles.

SPOKANE, WASH.—On a bid of \$40,545, the Washington Water Power Company was awarded the contract for installing the new ornamental curb lighting system on Post street from the end of Post street bridge to the north side of Third avenue.

SEATTLE, WASH.—City building department will erect the proposed power substation for the city lighting department at Fourteenth avenue N. W. and Forty-ninth street by day labor. Construction will be supervised by City Architect Daniel Huntington. The building is to be of reinforced concrete.

SEATTLE, WASH.—Purchasing agent of the Alaskan Engineering Commission, room 422, Bell street dock, will receive bids up to March 25th for furnishing the commission with electrical supplies, including 6600 feet of conduit, 40,000 insulators, 25,000 feet 5-16-inch cable and about 100,000 feet of wire.

COLVILLE, WASH.—A contract has been closed between the Washington Water Power Company of Spokane and the Stevens County Light & Power Company of Colville, whereby an electric transmission line, forty miles long, will be erected to furnish electricity in the southern part of Stevens County.

EVERETT, WASH.—The United Steel Company, which contemplates erection of a steel rolling mill here of 60 to 100 tons capacity, using two reheating and one electric furnace, has procured a site and established local offices. J. Johnson, general superintendent, has left for the East to procure machinery and equipment.

SEATTLE, WASH.—City Engineer A. H. Dimock has submitted plans for the proposed elevated railway to the shipyards and the board of public works has taken the plans under consideration. The road is to be a timbered elevated roadway to extend from First avenue South and Washington street to West Spokane street, estimated cost about \$350,000.

SEATTLE, WASH.—Puget Sound Traction, Light & Power Company has made application to the city council for a franchise for the operation of a street railway along Avalon way and Thirty-sixth avenue Southwest to the intersection of the latter street and West Snoqualmie street. With the request the company submitted a proposed franchise ordinance which provides for the completion of the line within twelve months of the granting of the franchise.

TACOMA, WASH.—By the unanimous consent of the city council, City Attorney U. E. Harmon was authorized to proceed with the drafting of two ordinances placing before the voters at the spring elections two propositions for the purchase of the Tacoma Railway & Power Company street car system and the acquisition of either a contemplated power plant or a site upon which the city may ultimately build

a plant. The two propositions will call for the expenditure in municipal utility bonds of approximately \$10,000,000. On April 2 the proposition of buying the street railway system will be put on the ballot, and two weeks later the voters will be asked to vote on the acquisition of a new auxiliary power plant.

PACIFIC CENTRAL DISTRICT

VALLEJO, CAL.—The Great Western Power Company is running its power line to the Cereda pumping station.

SACRAMENTO, CAL.—The Pacific Gas & Electric Company plans to extend its transmission lines to Guinda, Rumsey and Brooks.

OAKLAND, CAL.—The Pacific Telegraph and Telephone Company has let the contract for the erection of a six-story class A building at 150 North Fifteenth street.

OAKLAND, CAL.—The San Francisco-Oakland Terminal Railway Company is considering the construction of a railway line on Adeline street, from First to Sixteenth.

FRESNO, CAL.—The city trustees granted the petition of property owners to install electroliers on both sides of Van Ness avenue. In the bids the call will be for alternate tenders on cast iron and concrete electroliers.

OROVILLE, CAL.—Deeds placed on record gave the information of the acquisition by the Great Western Power Company of 320 acres on the south bank of the Feather river east of Oroville.

PITTSBURG, CAL.—The Pacific Gas & Electric Company has submitted a proposal to the city trustees for installing an electric service for the southwest addition. The cost is estimated at about \$2000.

SAN FRANCISCO, CAL.—The board of public works has awarded the contract for the "D" line extension on Greenwich street of the Municipal Railway system to Eaton & Smith, for the lump sum of \$28,600.

MONTEREY CREEK, CAL.—The Pacific Gas & Electric Company has shut down on its seven-mile tunnel in the Big Bend. Only two caretakers are on the payroll, one at the cove and the other at the intake end of the long bore.

FRESNO, CAL.—The San Joaquin Light & Power Corporation and the Mount Whitney system tied their power transmission lines together at Strathmore in order better to stand the strain of unusual service in a dry year. It is planned to interchange power whenever necessary.

HANFORD, CAL.—Alpaugh is planning on a lighting system for the town site. The community, not being an incorporated city, will have to be organized on the state law providing for the formation of a lighting district. A petition will be circulated at once calling for an election on the question.

SAN FRANCISCO, CAL.—The United Railroads filed with the board of supervisors a demand on the city for \$288,500 damages it says it has suffered through the blanketing of its lower Market street lines by the Municipal Railway and by interference with its service caused by excavations made when the Municipal Railway tracks were installed.

SACRAMENTO, CAL.—J. B. Thompson of Vina, Tehama County, has applied for 100,000 acre feet of waters of Butte creek, in Butte County, for the irrigation of lands in Townships 20, 21 and 22. The same applicant also filed application for 30,000 acre feet of Inconstance and Mountain House creeks, in Siskiyou County, for irrigation on 4000 acres.

SACRAMENTO, CAL.—One-man, pay-as-you-enter front entrance street cars were placed in operation here on one of the local lines operated by the Pacific Gas & Electric Company. The operator, who also acts as conductor, "flags" railroad crossings by stopping thirty feet from the tracks and looking both to his right and left before approaching nearer.

REDDING, CAL.—The Northern California Power Company has informed the city trustees that for legal reasons connected with the terms of its bond issue it cannot set a price on its lighting system for sale to the city. The only

way the city can acquire the system, the company states, is by condemnation proceedings. The city trustees adopted the ordinance calling for an election for "acquiring or building" a system of electric lights for the city.

OAKDALE, CAL.—The Sierra & San Francisco Power Company is preparing to enlarge its storage capacity in the mountains, as a result of an agreement signed with the Oakdale and South San Joaquin irrigation districts. H. F. Jacobson, president of the company, announces that plans are now under preparation for the construction of a third reservoir on the south fork of the Stanislaus river, which will provide 18,000 acre feet more of storage. This will increase their storage capacity in the mountains by 50 per cent.

BAKERSFIELD, CAL.—A new power plant to increase its present output by 20,000 horsepower is to be built at the mouth of Kern River canyon by the San Joaquin Light & Power Company. An application for 250 second-feet of water in addition to that already in use by the company from Kern river at that point has been filed with the state water commission. This will just double the energy now being used on the smaller plant of the company situated there. The plan is to dismantle the old plant after the new one is completed. The plant is to cost \$1,500,000.

THE PACIFIC SOUTHWEST

SANTA FE, N. M.—The village trustees of Des Moines have decided to vote on a \$50,000 bond issue to purchase and extend the water and light service.

PASADENA, CAL.—The city purchasing agent has been authorized to purchase, without advertising, lamps, fuel oil and meters for the light department.

WILMINGTON, CAL.—The Chamber of Commerce has launched a movement to call for an election to vote \$150,000 bonds to put water and gas mains in every street in the city.

LAS VEGAS, N. M.—W. S. Townsend, local manager of the Las Vegas Light & Power Company, promises that much needed repairing and overhauling will be done within the next few months.

AZUSA, CAL.—Preparations are being made to increase the output of the substation of the municipal electric lighting system to 600 kva., at a cost of about \$4000. Norman E. Humphrey is superintendent.

SANTA BARBARA, CAL.—The city council has received a petition for ornamental lights on Chapa street from Gutierrez to the boulevard. The city engineer has been instructed to prepare plans and specifications for the work.

YUCAIPA, CAL.—A survey has been made for the proposed Pacific Electric line from Redlands to Yucaipa City. As to when building operations are to commence both the railroad and land company officials are non-communicative.

LOS ANGELES, CAL.—A resolution was adopted by the city council ordering the installation of necessary marbelite lighting posts and appliances and the supplying of electric current for the lighting of Fifty-fifth street, between Budlong avenue and Normandie avenue.

SKULL VALLEY, ARIZ.—Negotiations with the Mountain States Telephone Company have been started by local farmers and stock growers, who have organized the Skull Valley Producers' Association. It is hoped that a telephone system will be completed here before this year's produce is ready for market.

DEL MAR, CAL.—The State Railroad Commission has authorized the sale of the electric distributing system of the Del Mar Water, Light & Power Company to the San Diego (Cal.) Consolidated Gas & Electric Company, for a consideration of \$11,055. The water system of the company is not included in the sale.

WILLIAMS, ARIZ.—Another unit is needed at the municipal light plant in order to make the best use of the machinery and not injure the engine by running it at a time when it might better be stopped for cleaning or adjustment.

The council hopes to be able to add this unit soon. It will probably be a 100 horsepower engine.

SAN DIEGO, CAL.—The Railroad Commission has granted the San Diego Consolidated Gas & Electric Company permission to distribute and sell electricity under a franchise granted by San Diego County, provided it does not operate in the territory now served by the Del Mar Light & Power Company or the Escondido Mutual Water Company.

LOS ANGELES, CAL.—The problem of raising more money for the installation of an ornamental lighting system on Broadway has been shifted to a finance committee of the city council. The lowest bid for the contract is approximately \$65,000, while only \$60,000 has been raised for the work. Unless a contract is let at once bids may be withdrawn, as the cost of materials is increasing.

LOS ANGELES, CAL.—The public service commission has authorized leasing from the harbor commission of a tract of land on the east side of the harbor boulevard, to be used as a site for a substation for the municipal power system. The purpose is to provide a substation from which power service can be given the industries around the west basin and to pier No. 1, and across the channel in the Wilmington district.

SAFFORD, ARIZ.—The local office of the Mountain States Telegraph & Telephone Company has received shipments of material that will be used in reconstruction of an outside plant of the company's new system. A telephone line will be built to Solomonville. Thatcher and Solomonville will be served from the Safford exchange. A new switchboard, double the capacity of the present board, will be installed in the local exchange. New poles will be put in and new cables strung.

GALLUP, N. M.—The Gallup town board has taken initial steps toward holding an election to decide on whether or not the people want municipal ownership of the electric light plant. The board intends to vote on municipal ownership quotation and vote bonds at the same time. A petition asking the council to begin formalities required to install lighting and power plant was presented and an engineer will be employed by the city to estimate the cost of the plant and furnish necessary data.

LOS ANGELES, CAL.—George L. Lamy has applied for 50 cubic feet per second of Lake Elsinore, tributary to the San Jacinto river, in Riverside County, for power purposes. The proposed works contemplate an open cut and cement pipe with concrete headgate in the lake and a canal and pipe line thirty-five miles in length. By a drop of 800 feet it is proposed to develop 3300 theoretical horsepower. The amount of water to be stored is 130,000 acre feet and the estimated cost of the project is placed at \$300,000.

PARKER, ARIZ.—The government has appropriated \$50,000 for making surveys and estimates of the cost of constructing a complete irrigating system for tillable lands in the Colorado river Indian reservation. Appropriation of \$20,000 is made for drilling wells on the Papago reservation; \$50,000 has been set aside for the construction of the main canal leading from the diversion dam on the Gila river; a like amount was added to the appropriation for the dam and bridge across the river at Sacaton, and \$20,000 for new work on the Ganade project in Apache County.

PHOENIX, ARIZ.—Plans are being made for the lease of about half a township on the northern edge of the Pina Indian reservation south of Chandler. The tract is to be reclaimed with wells, from which pumping will be by electricity. Farther to the westward another 10,000-acre tract has been leased by Lincoln Fowler of Phoenix. The tract will be irrigated by discharge from the Tempe-Kyrene drainage canal. In addition to these tracts the agricultural area of the reservation will have expansion by 40,000 acres through two dams to be built across the Gila by the Interior Department at \$250,000 cost.

THE INTER-MOUNTAIN DISTRICT

DUBOIS, IDAHO—The Dubois Light & Power Company has filed articles of incorporation for \$25,000 and selected a site for building a power plant.

SALT LAKE CITY, UTAH—The city recorder has been instructed to advertise for bids for the installation of a special street lighting system on Regent street.

WORLAND, WYO.—The Worland Light & Power Company expects to install a 125 horsepower boiler and also to purchase various instruments for a switchboard. J. M. Atkinson is manager.

CHESTER, MONT.—Steps have been taken by local citizens to secure a better lighting system in Chester. It is proposed to have the Montana Power Company extend its service to the town.

COLORADO SPRINGS, COLO.—The Golden Cycle Company is considering the construction of an electric power plant. At present the company secures electricity from the Colorado Springs Light, Heat & Power Company under a contract which does not expire until 1920.

NAMPA, IDAHO—A committee has been appointed to investigate the proposed new electric lighting contract. The old contract of \$30 per month for arc lights was secured some time ago and the contract will soon expire, and the light company now wants \$66 for the same service.

CALDWELL, IDAHO—Superintendent of Streets D. D. Campbell stated to the council that the Pioneer irrigation district had agreed to pay half the cost of a concrete bridge across Speedway avenue, if the city will pay the other half, in accordance with plans to be approved by the city engineer.

DUBOIS, IDAHO—The Dubois Light & Power Company, recently incorporated with a capital stock of \$25,000, is planning to construct an electric plant to furnish electrical service in Dubois. A power site has been purchased on Beaver creek near Dubois, where a dam 46 feet wide at the top and 26 feet high will be built.

DENVER, COLO.—The Queen City Foundry Company of Denver has placed an order for a one-ton Booth-Hall electric steel furnace to replace the converter equipment now in use. The furnace has a holding capacity of three-quarters to one ton, and is rated at 300 kva. Energy will be delivered to the furnace by the Denver Gas & Electric Company.

PROVO, UTAH—Application has been filed with George F. McGonagle, state engineer, by Scott P. Stewart of Provo for permission to take from the north and south branches of North Fork creek 10 second-feet of water. The plans provide for the construction of a cement dam and a 21-inch iron or wood stave pipe to carry the water to a point where power will be generated by a Pelton water wheel, operated under a 1400-foot head of water. Electricity generated at the proposed plant will be distributed in Utah and Wasatch counties.

TWIN FALLS, IDAHO—At a meeting of about 100 citizens of Twin Falls, Buhl and Filer, convened to discuss ways and means of securing a mutually owned electric power and light plant and distributing system to serve this district, resolutions were adopted endorsing the principle of the public ownership of power plants. The resolution adopted further declared in favor of taking over the partially developed power site at Clear Lake.

MONA COUNTY, NEV.—Plans for a \$50,000 power development, to be installed on the east side of the Sierras, were revealed to the State Water Commission in the application of A. M. Wishart, Alexander Cameron and Jabes Herin to secure the necessary water rights. These three residents of Yerington, Nev., ask permission to impound 20 second-feet of the waters of Sweetwater creek, in Mono County. They propose to build a dam 10 feet high and 48 feet long and running from the pool so formed is to be a metallic flume three and a half miles long. There is a fall of 1132 feet and this, it is estimated, will develop 2575 horsepower.

Ad-itorial Comment

(Advertising is as important a factor in the distribution of goods as is transportation. Advertising helps to create the demand, the salesman closes the sale and the railroad delivers the goods. Without the creation of the demand the distribution would be extremely limited. Advertising is thus a strong constructive force in the selling field.—The Aditor.)

Pacific States Electric Co. tells of its ability to meet demands for all kinds of overhead line construction material.

Standard Underground Cable Co. advocates Standard cable accessories as the best means for protecting electric cable systems.

Baker-Joslyn Co. calls attention to the strength of the single interwoven wall of Duraduct flexible tubing for use in electrical construction.

Crocker-Wheeler Co. demonstrates that freedom from need for repairs justifies the slightly higher initial cost of Crocker-Wheeler motors.

Pierson, Roeding & Co. announces their retirement from business and the use of the present organization by the Aluminum Company of America.

Crouse-Hinds Co. illustrates actual installations where Z Y Condulet small motor switches are protecting motor-driven tools for machine shop and other uses.

V. V. Fittings Co. advertises vapor-proof fittings and safety devices for all classes of marine electrical installations or other places exposed to severe weather conditions.

Hubbard & Company shows an actual installation of Peirce spreader brackets and forged steel insulator pins strengthening line construction by eliminating weak points.

Moloney Electric Co., notwithstanding a 500 per cent increase in production during the past 18 months, announces that it is still able to make the best transformer deliveries obtainable.

Wells-Morris Mfg. Co. is making at San Francisco a new starting switch for motors of 5 hp. and less, 125-250 volts. This switch has the approval of accident commissions and the underwriters.

The Habirshaw Electric Cable Co. emphasizes its educational advertising work among building owners regarding the confidence that is to be reposed in architects, electrical engineers and contractors.

Allis-Chalmers Mfg. Co. devotes two pages to arguments for hydro-electric installations as conservers of fuel, suggesting further installations as advisable. Typical installations are handsomely illustrated.

The American Conduit Mfg. Co. urges contractors to read "The Wiremold Selling Plan," a book telling how people are being educated in the use of Wiremold in making convenient electrical extensions in home, factory and office.

General Electric Co. explains how the addition of sphere gaps has increased the speed of discharge of electrolytic arresters and thus affords better protection from lightning; also how G. E. synchronous condensers increase the capacity of existing systems by improving the power factor.

Landers, Frary & Clark presents the new cut-out which will stimulate the sales of Universal electric irons this spring.

The Electric Storage Battery Co. suggests the advantages of electric industrial trucks equipped with the "Ironclad-Exide" battery.

Century Electric Co. features the ring oiling bearings with which Century motors are equipped as another reason for their serviceability.

National Carbon Co. lays emphasis on the care with which Pyramid Brushes are designed to meet the most exacting conditions of operation.

The Youngstown Sheet & Tube Co. tells of the satisfaction that comes from the use of Buckeye rigid conduit and Realflex flexible armored conductor.

Sprague Electric Works sets forth several styles of conduit boxes and fittings with a suggestion that those interested secure the Sprague Conduit Bulletin for details.

Western Electric Co. suggests that Western Electric fans and sales helps are the best insurance against a poor fan season. Dealer co-operation is strongly suggested.

The Square D Co. presents a striking illustration of the protection that can be accorded even the most careless workman by the use of Square D steel enclosed switches.

The Robbins & Myers Co. gives emphasis to the satisfaction which the user gets from Robbins & Myers fans, whose beauty of design is given prominence in the advertisement in this issue.

Garland-Affolter Engineering Co. suggests special features in which Howell polyphase motors excel for severe service. Announcement is also made of conveniently situated stocks of Peerless fans.

Edison Storage Battery Supply Co. shows how Edison storage battery trucks and tractors are releasing man-power and giving the highest service efficiency for all sorts of industrial establishments.

L. Plaut & Co. reproduces one of the advertisements whereby it is popularizing the Four-in-One Light and thus facilitating sales by the electrical dealer. A country-wide list of distributors is also given.

Locke Insulator Mfg. Co. announces that the Pacific States Electric Co. have been appointed its Pacific Coast representatives coincident with the withdrawal of Pierson, Roeding & Co. from the selling agents' field.

Westinghouse Electric & Mfg. Co. advises conservation of copper for feeder circuits by installing Westinghouse feeder voltage regulators. Attention is also called to a new 14,000 kva., 150,000 volt transformer, the largest single phase transformer ever built, as an example of the company's facilities for taking care of customers' needs.

JOURNAL OF ELECTRICITY

VOL. 40 NO. 7

SAN FRANCISCO, APRIL 1, 1918

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Saturday Evening Post

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May 4, two-page, 2-color, center spread	9,936,661
June 29, two-page, 2-color, center spread	9,936,661
Feb. 23, full page - - - -	9,936,661
March 9, full page - - - -	6,937,661

Ladies' Home Journal

May 1, full page, 4 colors - - -	8,216,122
June 1, full page, 4 colors - . -	8,216,122

Good Housekeeping

May 1, full page, 2 colors - - -	2,025,000
July 1, full page, 2 colors - - -	2,025,000

Literary Digest

Feb. 16, full page - - - -	4,550,000
March 2, full page - - - -	4,550,000
March 16, full page - - - -	4,550,000

Total number of readers 73,878,888

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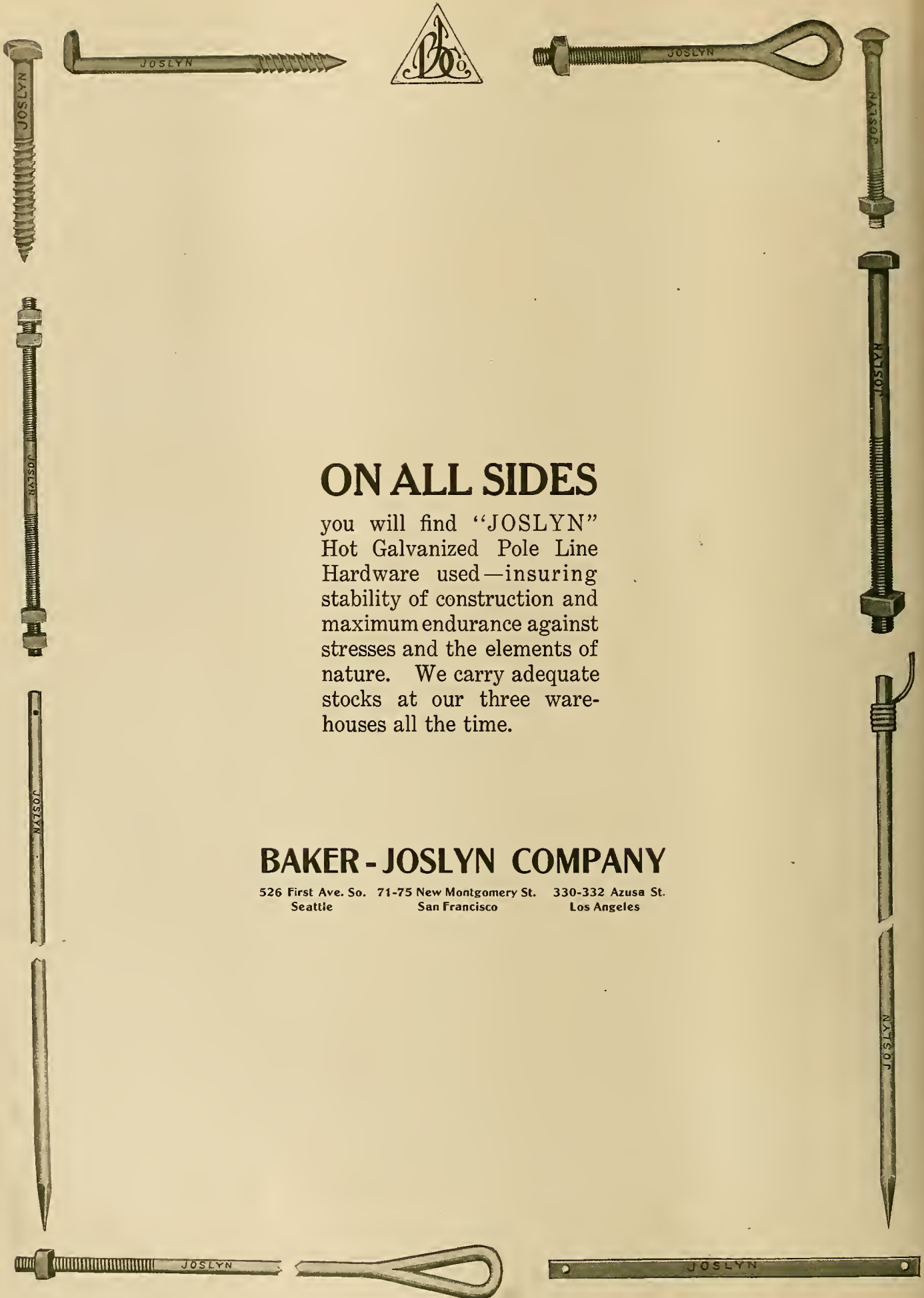
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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, APRIL 1, 1918

NUMBER 7

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HERE is a gathering of three hundred prominent men of the electrical industry—a past president of the American Institute of Electrical Engineers, a founder of a great electric appliance manufacturing establishment, the commercial agents of the two greatest hydro-electric central stations in the world, the designer of the most beautiful system of electrical illumination known to history, and a host of other men of equal prominence—gathered together in Los Angeles, March 15, 1918, for the purpose of launching a co-operative electrical

campaign that is as potential in its possibilities for the future as it is unique in its organization at the present. The setting of such ideals as these mark the dawning of a new era in the commercial and industrial life of the nation that—like the ripple in the great ocean caused by the dropping of a stone—will eventually pass even to foreign shores and make its effect felt in the modeling of a better and more efficient world. Such ideals of democracy will eventually prove more powerful than any other factor in the bringing of permanent world peace.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, APRIL 1, 1918

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Synergy —

Recent developments in affairs electrical upon the Pacific Coast have witnessed the establishment of a new era of co-operative effort among all branches of the industry. The general unsettled conditions that have prevailed in the electrical industry in the past may in some respects be likened to the conditions that are still keeping world affairs in a state of ferment.

The electrical industry during the past quarter of a century has grown so rapidly and to such gigantic bounds that today the invested capital may well be placed among the four or five great divisions of national financial strength. Due to the vast expansion of electrical application in countless commercial and industrial uses, the continued harmonious development of this great industry is as a consequence of vital interest to the nation as a whole at this critical period.

Much has appeared in the press of late relative to the necessity of opening up the great natural water powers of the nation as well as the necessity of maintaining the financial credit of public utilities concerned with electric generation and distribution. Little has, however, appeared concerning the many complex questions involving all branches of this great industry, the solution of which might well bring about a more harmonious workable relation in developing the industry. When it is realized that gigantic savings in the cost of production and distribution, as well as a vast extension of the uses of electrical energy are possible under co-ordinated effort, the problem not only becomes one of intense interest to the several branches of the industry itself, but due to the necessity for conservation of national strength on all sides, it at once assumes an importance that might well attract the interest of the public generally. Especially is this true when the same co-operative ideals might well be applied to many other channels of national effort.

Some years ago there originated in the West a movement for the co-ordination of the problems of the electrical contractor-dealer in the merchandising of electrical ware. This movement, now known as the Goodwin plan, in recognition of the active and valuable work done by W. L. Goodwin in assisting to make it effective, proved so helpful that it has in recent months been promulgated throughout the width and breadth of the nation. This effort is today meeting with wide approbation on all sides.

In recent months there has again been evolved in the West a plan for a co-operative electrical campaign that bids well to bring about still greater possibilities in work of this nature, the result of which should vastly extend the uses of electrical energy and at the same time minimize the human effort involved.

The sum of \$12,000 has been raised in California jointly by the manufacturers, jobbers, central stations and electrical contractor-dealers for the initial expense in carrying on a campaign of co-operative educational work. Two field agents have been employed who are to work under an advisory committee serving without

salary, composed of men representing all branches of the industry, and who are eminently qualified to direct the difficult problems that may arise from time to time.

These field men are to work from one end of the state to the other, offering suggestions, gathering information, encouraging here and helping there, in every manner possible.

During the past few days a mass meeting has been held in Los Angeles, where some three hundred leaders in the electrical industry gathered from all sections of the state to launch this campaign of mutual helpfulness. Detailed accounts of what transpired at this meeting may be found on other pages of this issue.

Suffice it to say that to such a high degree were co-operative ideals raised that every one who attended this meeting went away feeling that the future has much in store from the helpful effects of this campaign.

It is clearly evident that it will be only a short period hence when such ideals of co-operative helpful-



In these momentous times it is well to bear in mind the three great rules necessary for the accomplishment of worth-while human tasks—patience, patience, patience.



ness will be extended by similar means not only to merchandising but to power conservation, fuel saving, and to financial and engineering problems generally.

Indeed, those who thoughtfully carry to its ultimate conclusion the helpful ideas brought out can not help but realize that this new movement is but ushering in a new ideal that must be brought into play in world problems generally, for by it only can many of the false ideals of socialism which are seemingly so prevalent at the present time be effectively met.

The West has now entered upon a new era of intensive co-operative helpfulness. At the recent remarkable meeting of electrical men in Southern California, described on another page of this issue, held for the purpose of instilling a higher, more effective spirit of mutual helpfulness, the toastmaster—one of the most prominent men of the electrical industry in the West—referred to the Journal of Electricity as a powerful instrument for good in the electrical industry of the West.

Here is a suggestion for, practical co-operation. There are two distinct ways in which our readers can make this service of even more effective strength—by mentioning the good work of the Journal to your friends, and by patronizing its advertisers in every possible way.

The Journal of Electricity has for years carried in its advertising columns the highest grade of manufacturers of electrical ware known to the industry the country over. None but clean, clear-cut business firms are admitted to the privilege of advertising in its columns.

By patronizing these advertisers it enables them to broaden their excellent product and thus raise the industry to a higher state of perfection. Again, by mentioning the Journal of Electricity it increases its value as an advertising medium in direct proportion to the number of times it is mentioned. And best of all, there results through this patronage on the part of the reader a direct benefit to the reader himself, in that a periodical which thrives financially is enabled to give better and fuller service in its efforts to upbuild all that is good and wholesome in the electrical industry.

In the recent discussions of new water power legislation at the national capital, sharp differences of opinion as to whether the government should make water power development a source of revenue have been brought to light.

Water Power Taxation

Those who are most familiar with water power development, including engineers of the Forestry Bureau, representing Secretaries Baker, Houston and Lane, are advocating that it is better to count on reduction of rates to the consumer than on obtaining revenue for the government. On the other hand, certain Eastern legislators are insistent that water power development should be revenue producing on the grounds that the American people are now heavily taxed for the war, that additional money is needed and

that the government should not shut itself off from such a profitable source of income.

Under the proposed bill the lessees of the water power would pay nominal rentals to the government with penalties in the form of higher rentals provided in the event of overcharge to consumers. Rates to be paid by users of the power would be fixed by a commission to be composed of the Secretaries of War, Agriculture, and Interior.

Only those who have followed closely the growth of water power development with its many obstacles that must be overcome, can appreciate the absolute necessity of the provision for nominal rentals even in ordinary times. But in these momentous days, when a power crisis faces the entire nation and when water power development means so much for the saving of fuel and the turning of the wheels of industry, it is rather surprising that any one questions the advisability of immediate action of unlocking the water power resources of the nation on the basis of nominal rentals, protected as they are to be with fair and proper provision for rates and repurchase on the part of the government, if desired at a reasonable period in the future.

A charge of ten cents per horsepower as a minimum and fifty cents as a maximum for the nominal rentals involved appear reasonable and proper. Indeed, the bills as now pending before Congress looking toward the solving of the present crisis in power development, with minor changes, offer entirely workable conditions.

The Third Liberty Loan, to be floated in April, will undoubtedly from its very patriotic appeal sweep all objections before it. But beneath the appeal to the emotions there is a soundness of business and financial standing that makes this series of loans a most valuable acquisition to every American citizen.

Statistics from the Treasury Department covering former governmental loans are interesting. The credit of the United States was so high and unquestionable that in 1900, two years after the Spanish War, 2 per cent bonds were offered at par and oversubscribed. This is a financial performance no other nation has ever equaled.

United States 4 per cent bonds in 1888 sold as high as 130 and in 1901 brought 139 $\frac{7}{8}$ on the stock market.

The United States has never defaulted on any of its bonds. Not one of its bondholders has ever lost a cent of principal or interest except those who voluntarily have taken losses by selling their bonds in a period of temporary price depression. One hundred cents on the dollar, principal and interest, has the United States always paid.

Back of the \$250,000,000,000 to \$300,000,000,000 of our national resources stands the rugged honesty of America. Liberty Loan Bonds are the safest security in the world.

A Bit of Financial History

Each day there is impressed upon the mind of every thoughtful citizen the necessity of the maintenance of public utility credit throughout the nation. In our last issue editorial comment was made upon the good that is bound to result from the recent written utterances of the Chief Executive along these lines.

Maintenance of Public Utility Credit

In view of the situation in which utilities of the West are being placed by reason of rapidly increasing costs of operation which have made necessary a number of applications to the various state bodies for increased fares and rates, the following extract from the annual report of John Skelton Williams, Comptroller of the Currency, is extremely interesting and timely:

"The first and most direct relief to the public utilities corporations can be given by the state public utilities commissions and municipal and local authorities, with the broad-minded co-operation of the people generally, understanding the necessities of war and realizing that the more promptly its burdens are accepted the sooner they will be lifted. It is essential that forbearance and consideration be exercised by the state commissions and municipal authorities, and that the corporations also be permitted to make such additions to their charges for service as will keep in them the breath of solvency, protect their owners against unjust loss, and give them a basis of credit on which they may obtain the funds with which to meet the strain put on them by the Government's needs. The breakdown of these corporations would be a national calamity."

The possible breakdown of the public utilities that furnish our industries with power would mean even more serious national difficulties than were involved in the recent collapse of the railroads, for the crippling of industrial output would be sure to follow and the remedy is not so easy at hand when quality and continuity of service becomes impaired in the power supply.

Hence it is with extreme satisfaction that we view an increasing interest on the part of the national government and on the part of the state regulatory commission to grant relief by the raising of rates and thus maintain public utility credit on a workable basis.

An announcement of unusual interest has recently been sent out by the official bulletin at Washington—namely, the arrival in England of delegates from all the allied countries for conference on international standards. At this conference, consideration will be given to the standardization of manufacturing materials as related to the production of machinery, motors and aircraft.

The American delegation includes members from all the prominent engineering societies of the country. The purpose of this inter-allied meeting is to enable

better industrial service to be given with less man-hour effort, through relieving plants from carrying in stock unstandard materials for which there is a small call, and concentrating on materials of known performance for the same work.

This movement may be characterized as one of the great good benefits that may be directly attributable to the present international war. It is interesting to note in passing that over a hundred years ago the beautiful standardization of fundamental units resulting in the establishing of the metric system, was a direct outcome of the awful throes of the French Revolution.

As far back as history bears record, the confusion of tongues resulting from diversity of methods and varying standards of design has caused calamities beyond number. Indeed, reading between the lines, it may well be inferred that the abandonment of the great engineering feat of Biblical record—the building of the tower of Babel—was perhaps directly attributable to this cause.

In the upbuilding of the commercial and engineering arena of the future—the Pacific ocean, its islands, and the lands washed by its waters—the early standardization of manufacturing materials, units of measurement, questions of design, facility for commercial exchange and a thousand other matters, must perforce prove of inestimable value.

This question of standardization is each day brought nearer and nearer home to engineers and men of the electrical industry in the West. The growing trade relations with Oriental and South American ports demand that every facility be given to improving standardization. Engineering and commercial bodies in the West would do well to take action looking toward some concerted effort in arriving at permanent understandings in standardization among all Pacific neighbors.

The past few days have witnessed in the West the celebration of the fiftieth anniversary of the University of California.

The Semi-Centennial in California

The twenty thousand sons and daughters of this great university are today carrying a wealth of inspiration and human sympathy, acquired in its halls, to every quarter of the globe.

The Journal of Electricity extends its greetings and best wishes to this fellow laborer in spreading the gospel of light to the uttermost places of the earth. In the West today the electrical industry is giving to the world at large new ideals in human endeavor and in human progress, and to her great institutions of learning is due lasting gratitude for the lion's share in this great accomplishment.

THE NEW JOURNAL SERVICE: The next issue of the Journal of Electricity will feature the remaining advance papers of the Del Monte convention of the Pacific Coast Section, N. E. L. A., the first series of which is set forth in this issue. Due to the fact that a remarkable electrical co-operative campaign has just been initiated in California that will undoubtedly set new records of accomplishment well worthy the thoughtful study of all men interested in the subject of merchandising, the Journal of Electricity has made arrangements to feature in successive issues, the progress of this unique campaign. Electrical men not only west of the Rockies, but throughout the length and breadth of the United States, should find these succeeding issues of the Journal of Electricity indispensable in value.

The volume of business with Eastern concerns has grown to such proportions in recent months that the Journal of Electricity has found it necessary to open offices in New York and Chicago, as announced on the page devoted to the table of contents.

CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

(Twelve thousand dollars have been raised in California from the central stations, the manufacturers, the jobbers, and the electrical contractor-dealers, to forward a co-operative campaign among all branches of the industry. This campaign heralds the founding of an institution that is unique in the annals of the nation. The effective results that are bound to be brought about from its co-ordinated work will again undoubtedly carry Eastward a new idea in helpfulness that will place the West upon a pinnacle of even still greater leadership in all things good and wholesome for the upbuilding of matters electrical.—The Editor.)

Los Angeles witnessed on the evening of March 15, 1918, at Christopher's Cafe, a gathering of three hundred men—perhaps the most representative grouping of men from all branches of the electrical industry intent upon the establishing of a harmonious, workable relationship, ever assembled under one roof. The occasion was the first public launching of the California Electrical Co-operative Campaign described in full detail in the Journal of Electricity, January 15, 1918, page 84. S. M. Kennedy, general agent of the Southern California Edison Company, acted as the genial toastmaster of the occasion, and by putting across a series of cleverly conceived stunts, kept those at the banquet in a continual state of good nature throughout the evening. His witty injection of the word "synergism"—the religion of co-operation—also shows the broad general characteristics of the leader of the evening.

The following program was rendered:

Willis H. Booth.....	Reciprocation
Chairman of the Board, Edison Electric Appliance Co.	
W. D'Arcy Ryan.....	Electrification
Illuminating Engineer, General Electric Co.	
L. H. Newbert.....	Co-ordination
Chairman Advisory Committee, California Electrical Co-operative Campaign	
G. E. Arbogast.....	Affiliation
President, Southern California Electrical Contractors and Dealers	
Robert Sibley	Unification
Editor, Journal of Electricity	
D. J. Butts.....	Co-operation
Manager, Western Electric Co.	
Albert H. Elliot.....	Synergism
Attorney-at-Law	
B. F. Pearson.....	Synchronism
Superintendent, Southern Division, Southern California Edison Co.	

Two of the excellent papers delivered at the meeting are herewith published in full. The terse points brought out in these two papers are characteristic of all the able talks that were presented. Among the other speakers the clear presentation of the purposes of the Electrical Co-operative Campaign by L. H. Newbert, and the limits and forceful differentiation of the several fields of activity of manufacturer, jobber, contractor-dealer and power company as brought out by Albert H. Elliot, deserve especial mention.

Summarizing the meeting as a whole, perhaps the words of Rudyard Kipling can best be used to describe the conclusions carried away by those present when

formulating in mind the necessary interlinking for true co-operation, when he said:

"It ain't the guns, nor armaments, nor the funds that they can pay,

But the close co-operation that makes them win the day.

It ain't the individual nor the army, as a whole,

But the everlasting team work of every bloomin' soul."

AFFILIATION

BY G. E. ARBOGAST

The greatest error evidenced in the electrical contractor field today, is the lack of appreciation of the importance of taking advantage of the opportunities that are before us.

Business men in any trade can no more proceed intelligently without affiliating with some society or organization for the purpose of joint study, mutual education, and united effort, all for the common good, than can an individual firm progress without conferences between members of the firm or heads of departments. Furthermore, it is essential that an industry be composed of factors whose interests can be amalgamated and co-ordinated.

An electrical contractor-dealer cannot afford to be without the helpful ideas and assistance to be derived by mingling with his fellow associates, which can only be gained through affiliation with some organization representing his particular craft, and by thus acquiring the combined impetus resulting from the experience of his fellow workers. Getting together, getting acquainted, and pushing ahead, shoulder to shoulder, is the only way this can be accomplished.

The successful man joins in co-operative efforts with others for the elimination of trade evils and the solution of trade problems. If the business man is suffering from cranial enlargement, he cannot "check up." It is utterly impossible for a man who is suffering from softening of the wits to see failure when he looks in the mirror. As Mencius said, "When men's fowls and dogs are lost, they know how to seek for them again, but they lose their mind and do not know how to seek for it." Like the crazy man who thinks everybody else in the world is crazy, so the man who is satisfied with himself, whose business is different, is satisfied that all the rest of the world is wrong, running after false gods, doing the inefficient thing.

Under present business conditions, community of effort is necessary. If every concern would contribute to the common stock of knowledge, its small investment would more than be returned by what it would get from all sources.

In affiliating with organized effort along co-operative lines, a broader outlook should be uppermost in the mind of the applicant than that of the mere quest of money. It may be said once for all, that no organization can live beyond the exigencies of the hour unless it has an interest above dollars and cents. A de-

Dollars are cheaper than failure.



BUY A LIBERTY BOND

sire to make greater profits may bring men together, but it will not hold them long; the motive is too sordid to encourage any large degree of enthusiasm, and without enthusiasm no movement can go forward. Men, whether in an association or not, should consider certain relations, but when organized, they must consider them. These relations may be outlined as follows:

1. Relations of members to one another.
2. Relations with employees.
3. Relations with those to whom they sell—customers.
4. Relations with those from whom they buy.
5. Relations to the public generally.

Just to the extent these relations are understood and co-ordinated, will the organization justify its existence.

The old method of getting business, which is rapidly falling into discard, was founded on the theory that no one class or individual could profit except at the loss of some other.

The theory of efficiency and conservation now advocates that no class can profit in the long run except as others prosper.

Under the old theory, it was inevitable that each class should organize within itself to gain all it could at the expense of the community.

Under the theory of the new, each class—the manufacturer, jobber, central station, and electrical contractor-dealer—will organize in co-operation with each other to increase the prosperity of the entire community and secure only its fair share of such increased prosperity.

Through the activities of the California Electrical Co-operative Campaign, which has recently been so successfully launched, a great opportunity is presented for expansion of the industry in California. Not only has the manufacturer, jobber and central station an opportunity to increase his business, but the contractor-dealer, last but not least, has the greatest opportunity ever afforded for rendering a real service, first to his country, second to the industry, and third to himself.

CO-OPERATION

BY D. J. BUTTS

The word "co-operation" is derived from the Latin words meaning labor and together, or labors on the same plane. Co-operation is something out of which we all derive some benefit in direct proportion to the energy, effort and enthusiasm we put into it.

"Whether you like it or not," says the New York Mail, in a recent editorial, "you only have to look about you to see that the old way of unlimited competition is passing away in the business world. The first step in this direction in this country is occurring in the distribution of the necessities of life. In every line, co-operation is bound to supplant the competitive agencies that it displaced. Due to engineering skill and the agencies of the steam, gasoline and electric power, production has ceased to be the predominant factor in industrial life, and the competitive system is applied only where there is a market that is over-supplied. The United States has been passing through a period of readjustment from the competitive system to some new form under which our industries may be regulated and prospered."

The Mail further says, as do many others who

understand the economic conditions, that this country cannot return to the competitive system.

Co-operation in the larger industries is fairly advanced—take the railroads as an example. Nearly half a million people are the owners of the railroads in the United States. Two million people operate them. These two and a half million people with their families represent one-eighth of the population of the United States.

The same condition exists in the iron and steel industries and the telephone and telegraph industry, and all others where there are a large number of employees.

This large distribution of capital and labor simply means that we must each co-operate in order to save ourselves or some member of our own family commercially.

Co-operation is being enforced by the present administration in various ways. One of the most noticeable and most recent is the work of the Food Administration. It has compelled wholesalers and retailers to co-operate. The administration has fixed the wholesale and retail price and the wholesale and retail distribution policy of the important foods and fuel, and, more than this, has fostered an organization of a policing system to see that the rules of the administration are enforced. This policing would probably be unnecessary if each person interested in the distribution of foods and fuel had a sufficient understanding and knowledge of their own problems. In other words, a broader appreciation of what co-operation means to their own business.

In the electrical industry, this co-operative spirit is expressing itself in this great California movement, of which this meeting is a part. For some time there has been some co-operation within the individual branches of the electrical industry. For instance, the work of the National Electric Light Association, the National Association of Manufacturers, the National Electrical Supply Jobbers Association and the National Electrical Contractors and Dealers Association, but we have now come to the time when all of these interests must work together. In order to make such a large co-operative scheme work out, it will be necessary for each one of us, as individuals, to fit into our place and play our part. This means that each of us must get the Big Idea and be really big men. When I say "big," I mean honest, straightforward business men, with a sense of humor and a knowledge of human nature.

Others will interpret the co-operative efforts as socialistic, or will not be able to get the idea at all. They will simply block the progress. California is especially noted for its excellent roads. These were built and are maintained by co-operation, but did you ever notice how one of these beautiful boulevards may be blocked by one lone, mountain-climbing ass?

There are three precious jewels in business that are being recognized as never before in history and these jewels are: co-operation, mutuality and reciprocity.

Make it your victory—

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ity. You help me and I will help you. Every man who holds a place in our allied industries, whether he be a contractor-dealer, a jobber, a manufacturer or represents a central station, is here by merit or by accident.

It is the degree to which he is able to interpret and practice co-operation that determines his value. If he lacks the vision of future possibilities or the trade necessity of co-operative team work, he is the kind of player that is soon relegated to the bush league.

In working out this California co-operative plan, it is probable there will be some mistakes, but, if each one of us does his individual part well, the plan will be a success and we can console ourselves with the thought expressed by one of our good writers—the people who make mistakes lead the world and the perfect people work for them running errands or counting columns of figures.

Co-operation means treating the other fellow fairly. If you do, no doubt you will get the same treatment from him. It is like the great national baseball game—it must be played by clean, honest players who do not practice slugging or foul tricks.

Co-operation is a vehicle much like a good automobile. Its speed depends upon how hard you step on it, how much power you furnish it. The more thought, hard work and honest endeavor you apply, the faster it goes and the more good or goods you can expect to deliver. It takes team work, not idle talk, to put the thing over. It requires concerted, individual action on the part of each of us. This means a great deal of individual training and a high standard of personal aim. The best expression of this aim is contained in the

following copied from the writings of one of our conferees in this room:

"I BELIEVE that progress only means more light. That in the world today electricity leads the van of progress, and is the greatest agent for doing the greatest amount of good to the greater number of people. That in advocating the use of electrical service I am helping to make life more cheerful, hopeful, healthful and useful.

"I BELIEVE that the world does not owe any man a living, but on the contrary, it demands a service of every man, and that the best I can do is the service asked of me.

"I BELIEVE in the efficacy of individual effort, and in the union of individuals, corporations and associations in a common cause, and towards a common end. I believe in the potency of consistent and persistent labor as a trump card in playing the greatest game in the world—Success.

"I BELIEVE in men with spines, not wishbones; in diligence, not laziness; in working, not waiting; in uplifting, not lowering; in boosting, not knocking; in harmony, not discord; in freedom, not friction; and in co-operation, not disintegration.

"I BELIEVE in the broad principle of co-operation because it is constructive, productive and far-reaching in its scope; because it enhances the value of individual effort, broadens usefulness, spreads knowledge, widens vision, increases prospects, decreases difficulties and multiplies opportunities.

"I BELIEVE in the 'generation' of a demand for electricity, the 'transmission' of broad-gage ideas, the 'distribution' of electrical knowledge, the 'transforming' of opposition to friendship, the 'stepping-down' from selfish narrowness, the 'stepping-up' from individual differences; and that each man in himself should be a 'come-along' of enthusiasm, so that the pull may be 'all together, all the time for everything electrical.'"

ATTENDANCE AT CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN DINNER

L. H. Newbert, Ch. Advisory Committee, Cal. Elec. Co-op. Campaign.
 Albert H. Elliot, attorney-at-law and Sec'y Pac. Coast Elec. Sup. Jobbers Ass'n.
 W. D'Arcy Ryan, Illuminating Engineer, Gen. Elec. Co.
 D. E. Harris, Sales Manager, Pacific States Elec. Co.
 Robert Sihley, Editor, Journal of Electricity.
 J. W. Redpath, Secretary Cal. Ass'n Elec. Contr's and Dealers.
 Willis H. Booth, Ch. of Bd., Edison Electric Appliance Co.
 G. E. Arbogast, Pres. So. Cal. Elec. Contr's and Dealers.
 H. H. Courtwright, Ch., Fresno Local Contr's and Dealers.
 P. H. Booth, V.-P. and Gen. Sales Mgr., Edison Appliance Co., Ontario (Hotpoint Division).
 J. T. Bowden, Salesman, Edison Appliance Co. (Hotpoint Division), Ontario.
 R. H. Manahan, City Electrician, Los Angeles.
 H. N. Beecher, Chief Elec. Inspector, Los Angeles.
 Frank McGinley, Elec. Inspector, Los Angeles.
 Chas. Stanton, Elec. Inspector, Los Angeles.
 H. G. Holabird, Holabird Electric Co., Los Angeles.
 F. M. Coker, Mgr. Coker Elec. Co.
 Joseph Neu, Electric Signs.
 J. E. Tucker, Mgr. Elec. Prod. Corp.
 P. D. Howse, Pres. Elec. Prod. Corp.
 W. J. Barman, Garnett Young Co.
 R. J. McHugh, Garnett Young Co.
 Theo. Burger, Mgr. Baker-Joslyn Co.
 W. W. Lane, Salesman, Baker-Joslyn Co.

W. C. Caffrey, Elec. Sales Co.
 R. B. Clapp, Manufacturers' Agent.
 E. C. Ebert, Manufacturers' Agent.
 M. V. Simpson, Manufacturers' Agent.
 R. Wolsberg, Electric Agencies Co.
 J. L. Kline, Mgr. West. Light & Fix. Co.
 E. J. Fleming, Mgr. Anglo Range & Refriger. Co.
 J. O. Mills, Secy. Ontario Power Co.
 E. B. Criddle, Gen. Agt., Southern Sierras Power Co., Riverside.
 J. E. King, Local Supt. Southern Sierras Power Co., San Bernardino.
 H. B. Lynch, Mgr. Pub. Serv. Dept., City of Glendale.
 F. E. Raymond, Sales Promotion, Pub. Serv. Dept., City of Glendale.
 L. E. Moselle, Ch. Clerk to Bus. Agent, Dept. of Pub. Serv., City of Los Angeles.
 W. F. Brainerd, Representative, Cal. Elec. Co-op. Campaign.
 A. L. Spring Representative, Cal. Elec. Co-op. Campaign.
 Henry Holland, Manufacturers' Agent.
 J. G. Pomeroy, Manufacturers' Agent.

Southern California Edison Company

S. M. Kennedy, General Agent.
 B. F. Pearson, Supt. of So. Div.
 W. L. Frost, Asst. Gen. Agent.
 A. W. Childs, Supt. of Sales.
 G. B. McLean, Asst. Supt. of Sales.
 D. M. Trott, Asst. Controller.
 J. W. Burns, Indust. Agent.
 H. N. Sessions, Com. Engineer.
 W. L. Boxall, Power Contract Agent.
 C. Peters, Asst. Sec'y.
 H. B. Fletcher, Ch. Appliance Salesman.
 C. H. Pierson, Advertising Agent.
 J. T. Huntington, Dist. Agt., San Pedro.
 E. H. Mulligan, Dist. Agent, Pasadena.
 A. A. Taylor, Dist. Agent, Pomona.

W. F. Nordholdt, Dist. Agent, Venice.
 W. R. Neelands, Dist. Agent, Santa Monica.
 W. M. McKnight, Dist. Agent, Redondo.
 F. A. Green, Dist. Agent, Long Beach.
 Fred Schwartz, Dist. Agent, Monrovia.
 C. H. Coulter, Dist. Agent, Van Nuys.
 W. A. Wallaber, Dist. Agent, San Bernardino.
 A. I. Whitehead, Dist. Agent, Vernon.
 W. D. Graef, Dist. Agent, Alhambra.
 W. C. McWhinney, Dist. Agent, Lancaster.
 N. Hearne, Jr., Dist. Agent, Ventura.
 Allan McKenzie, Dist. Agent, Oxnard.
 Stanley Lothridge, Dist. Agent, Santa Paula.
 R. H. Sterling, Mgr., Santa Barbara Gas & Elec. Co.
 R. I. Carruthers, Dist. Agent, Visalia.
 A. W. Frost, Ch. Clerk, Alhambra.
 A. L. McDonald, Sub-Agt., Hollywood.
 Z. L. Sherart, Salesman, Los Angeles.
 H. A. Brody, Salesman, Los Angeles.
 E. B. Hutchinson, Salesman, Los Angeles.
 W. L. Deinling, Dist. Agent, Santa Ana.
 P. J. Deninger, Dist. Agent, Whittier.

Los Angeles Gas & Electric Co.

A. B. Day, Gen. Manager.
 H. J. Kister, Asst. Gen. Manager.
 Frank Weiss, Mgr. New Business.
 T. B. Parks, Purchasing Agent.
 H. H. Ranlett, Supt. Los Angeles Office.
 E. R. Northmore, Supt. Distrib.
 F. E. Seaver, Asst. Sec'y.
 G. A. Riley, Elec. Inspector.

Contractors and Dealers

R. D. Aylsworth, Aylsworth Elec. Co., Inglewood.
 Don Blackmore, Salesman, F. E. Newbery Elec. Co., Los Angeles.
 R. C. Bell, Snyder & Bell, San Bernardino.
 H. C. Barnard, Salesman, F. E. Newbery Elec. Co., Los Angeles.
 J. P. Boring, Orange.
 O. J. Crow, Los Angeles.
 R. E. Carter, Purch. Agt., Beacon Light Co., Los Angeles.
 D. Coldren, Coldren Elec. Co., Riverside.



Men who enlist give both selves
and income.

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ALBERT H. ELLIOT, attorney-at-law, and Secretary for the Pacific Coast Electrical Supply Jobbers Association, was never before more beautifully effective than on this notable occasion in Los Angeles, when he told his audience that co-operation should be carried to such high ideals that it must indeed approach "synergism," or approach the working relationship of the human with the divine mind.

G. E. Capps, Mgr. Sierra Elec. Co., Los Angeles.
 J. H. Cannon, Cannon Elec. & Devel. Co., Los Angeles.
 C. F. De Baun, Monrovia.
 C. Driskell, Salesman, Wilson's Elec. Shop, Los Angeles.
 James Ellison, Salesman, Gans Bros., Los Angeles.
 R. H. Evans, Los Angeles.
 H. C. Folts, Pasadena.
 E. J. Fields, Field's Elec. Co., San Bernardino.
 Lou Gans, Gans Bros., Los Angeles.
 Gus Gans, Gans Bros., Los Angeles.
 A. P. Gaylord, Pasadena.
 E. H. Granger, Mgr. Granger-Hall Elec. Co., Ontario.
 G. P. Gerchens, Puente.
 C. F. Green, Mgr. Green's Elec. Store, San Pedro.
 G. H. Gillingham, Los Angeles.
 C. H. Heilborn, Pres. and Gen. Mgr. So. Elec. Co., San Diego.
 C. A. Holland, Los Angeles.
 Frank Hoover, Secy. and Treas., H. L. Miller Co., Pasadena.
 C. W. Jones, Pres. Pomona Fix. & Wir. Co., Pomona.
 J. C. Jacobs, Jacobs Elec. Co., South Pasadena.
 Orville Jones, Secy. Bungalow Fix. Co., Los Angeles.
 S. F. Jones, Winder & Jones, Covina.
 J. King, Store Mgr., So. Cal. Elec. Co., Los Angeles.
 L. H. Lang, Los Angeles.
 Geo. Legasick, Salesman, Woodill-Hulse Elec. Co., Los Angeles.
 G. Loveberg, Los Angeles.
 Robert Lloyd, Pres. Foulkes Elec. Co., Los Angeles.
 J. H. Lowe, Los Angeles.
 J. W. Lane, Lane Elec. Co., Long Beach.
 F. O. Lantz, Lantz Elec. Co., Long Beach.
 W. L. Le Sage, Estimator, Beacon Light Co., Los Angeles.
 S. E. Ledbetter, Salesman, Beacon Light Co., Los Angeles.
 Joseph Lieb, Anaheim.
 L. L. Leavitt, Store Mgr., Green's Elec. Store, San Pedro.
 T. F. Marshall, Hollywood.
 M. C. Madison, Los Angeles.
 W. A. McNally, W. A. McNally Co., Pasadena.
 H. L. Miller, H. L. Miller Co., Pasadena.
 F. E. Newbery, Pres. F. E. Newbery Elec. Co.
 E. K. Naudain, Mgr. Glendale Elec. Co., Glendale.
 J. A. Newton, J. A. Newton Elec. Co., Glendale.
 W. C. Nielson, Nielson-Smith Elec. Co., Santa Barbara.
 J. J. Prevost, Mgr. Pico Elec. Shop, Los Angeles.
 F. B. Potter, Los Angeles.
 Theo. Palmer, Palmer's Motor Shop, Santa Ana.
 J. C. Rendler, Mgr. So. Cal. Elec. Co., Los Angeles.
 C. A. Renard, Renard & Stary Elec. Co., Los Angeles.
 P. I. Sutter, Salesman, F. E. Newbery Elec. Co., Los Angeles.
 H. G. Stone, Mgr. Elec. Const. Co., Hollywood.
 H. A. Snyder, Snyder & Bell, San Bernardino.

N. L. Stary, Renard & Stary Elec. Co., Los Angeles.
 F. D. Stevenson, Los Angeles.
 Walter Smith, Smith Plumbing & Elec. Co., Van Nuys.
 W. M. Stockwell, Mgr. Ventura Elec. Co., Ventura.
 Roy Spillsbury, Supt. F. E. Newbery Elec. Co., Los Angeles.
 A. S. Tyler, Los Angeles.
 H. L. Vonder Kühlen, Los Angeles.
 J. E. Wilson, Wilson's Elec. Shop, Los Angeles.
 H. B. Woodill, Pres. Woodill-Hulse Elec. Co., Los Angeles.
 R. B. Winder, Winder & Jones, Covina.
 Chas. Walsworth, Mgr. San Pedro Elec. Co., San Pedro.
 W. P. Whipple, H. L. Miller Co., Pasadena.
 G. I. Aiken, Salesman, Beacon Light Co., Los Angeles.
 T. H. Few, Secy. and Treas. Foulkes Elec. Co., Los Angeles.
 B. R. Hensel, Los Angeles.
 G. E. Neefus, Salesman, Beacon Light Co., Los Angeles.
 H. N. Snyder, Santa Paula.
 T. G. Parker, Secy. and Treas. Golden State Elec. Co., Los Angeles.
 R. G. Williams, Store Mgr., Foulkes Elec. Co., Los Angeles.
 P. G. Wyman, Salesman, Golden State Elec. Co., Los Angeles.



G. E. ARBOGAST, President Southern California Electrical Contractors and Dealers, in speaking upon affiliation, brought out ideals of a working relationship well worthy the consideration of all thoughtful men. His words are printed in full elsewhere in this issue of the Journal of Electricity.

General Electric Company

J. O. Case, Loc. Mgr. Sup. Dept.
 C. M. Bliven, Loc. Mgr. Appar. Dept.
 C. E. Spaulding, Sales Manager, Edison Lamp Works.
 E. E. Valk, Loc. Engineer.
 S. E. Kearney, Loc. Auditor.
 H. W. Wood, Cashier.
 A. W. Arlin, Railway Salesman.
 C. T. Carr, Salesman.
 S. G. Gassaway, Salesman.
 J. H. Cunningham, Salesman.
 E. M. Ellis, Salesman.
 E. L. Nightingale, Salesman.
 A. Bachrach, Price Clerk.
 C. E. Cayot, Office Salesman.

Westinghouse Electric and Manufacturing Company

P. M. Lincoln, Consulting Engineer, East Pittsburgh, Pa.
 H. D. Stephens, Special Sales Repres., East Pittsburgh, Pa.
 K. E. Van Kuren, District Manager.
 G. O. Noble, Mgr. Pow. Div.
 C. D. Lamoree, Mgr. Sup. Div.
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 C. T. Yarbrough, Supt. Serv. Dept.
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 J. M. Morris, Sales Representative.
 H. H. Fogwell, Sales Representative.
 N. W. Sherman, Sales Representative.

F. E. Anderson, Sales Representative.
 H. C. Paulin, Sales Representative.
 H. O'Brien, Sales Representative.
 H. C. Thornburg, Salesman West. Lamp Co.
 J. A. Payton, Service Department.
 Pacific States Electric Company
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 H. C. Chapman, Asst. Treas.
 F. B. Nightingale, Appliance Specialist.
 A. E. Rimpau, Lamp Specialist.
 C. E. Spott, Illuminating Specialist.
 R. W. Hunting, Salesman.
 W. R. Edwards, Salesman.
 C. H. Pendleton, Salesman.
 W. H. Sexton, Salesman.
 R. C. Herb, Salesman.

Western Electric Company

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 O. S. Lair, Stores Manager.
 W. F. Gibbs, Asst. Treasurer.
 A. B. Vandercook, Telephone Specialist.
 O. S. Strain, Household Specialist.
 L. W. Drake, Salesman.
 L. E. Darrow, Salesman.
 J. G. Loomer, Salesman.
 F. M. Baum, Salesman.

Illinois Electric Company

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 D. C. Pence, Sales Manager.
 S. W. Murray, Asst. Secy. and Treas.
 Stanley Searle, Salesman.
 G. A. Vetter, Salesman.
 A. H. Reese, Salesman.
 E. B. Pinson, Salesman.
 J. A. Paulsen, Purchasing Agent.
 J. F. Adis, Order Clerk.

Graham-Reynolds Electric Company

N. W. Graham, Pres. and Gen. Mgr.
 D. L. Reynolds, Secy. and Treas.
 H. W. Allen, Salesman.
 Allen Smith, Salesman.
 E. E. Russell, Salesman.
 P. C. Ensley, Salesman.

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A. R. Fierce, President.
 Ross Hartley, Vice-President.
 C. F. Fisher, Salesman.
 W. S. Sweet, Salesman.

Listenwalter & Gough

P. G. Gough, President.
 C. E. Listenwalter, Secy.-Treas.
 O. G. Thorp, Salesman.
 S. G. Nolton, Salesman.
 Ward Listenwalter, Stock Clerk.

J. A. Roebling's Sons Co.

J. N. Colkitt, Sales Agent.
 J. H. Alexander, Office Salesman.
 Geo. Cedarlof, Price Clerk.
 Thos. D. McKeever, Salesman.
 Harry F. Folson, Salesman.
 W. G. Marks, Salesman.
 L. Kimball, Stock Clerk.

United States Steel Products Corporation

R. B. Rawls, Sales Agent.
 D. W. Smith, Sales Agent.
 B. B. Bevier, Asst. Cashier.
 D. P. Leach, Salesman.



B. F. PEARSON, superintendent of the Southern Division, Southern California Edison Company, affectionately known by all as "Uncle Ben," stirred his audience to their depths when he described his ideals of the point of contact that must be maintained between a man and his workers, and the consequent necessity of always putting into practice the principles of the Golden Rule.

You must face the boys when they return.

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POWER RESOURCES IN SOUTHERN CALIFORNIA

BY H. A. BARRE

(The power companies of Southern California are meeting the war demand for increased output. Immediate results are being obtained so far as possible by interconnection and a comprehensive program for future power development from hydraulic sources has been laid out. This thoughtful survey by a man who is electrical and mechanical engineer with the Southern California Edison Company, is part of the war program which is being presented by the Engineering Committee for the war service convention of the Pacific Coast Section, N. E. L. A., to be held next month at Del Monte.—The Editor.)

When the Railroad Commission called upon the power companies of California to consider what conservation of fuel could be made by inter-connection of systems and co-operative use of plants, the power companies were suddenly compelled to view their problem from a new and startling standpoint.

Previously each company was so busy with its particular kind of effort to keep just a little ahead of trouble, that the attention given to the study of the problems affecting the whole industry had been more or less restricted to matters of detail.

The moment that the necessities of the country caused the companies to think, first, of the means by which these necessities could be provided for, and, secondarily, of the manner in which their individual interests would be involved, some most impressive aspects of the conditions generally affecting the industry demanded the attention of every one.

It became realized that the power industry was a war necessity of the first magnitude, and that in California particularly, in addition to the demands on it for power for manufacturing war materials, it must accept the responsibility for providing power for irrigation, and the almost equally great responsibility for the greatest possible conservation of fuel oil.

It was next seen that in order to meet the demands upon them, the power companies of Northern California must provide an annual increase of generating capacity of 25,000 to 30,000 kw., and of Southern California about 25,000 kw., a total of not less than 50,000 kw. per year. In addition to this amount of generating capacity, corresponding increases in transmission and distribution plant must be made.

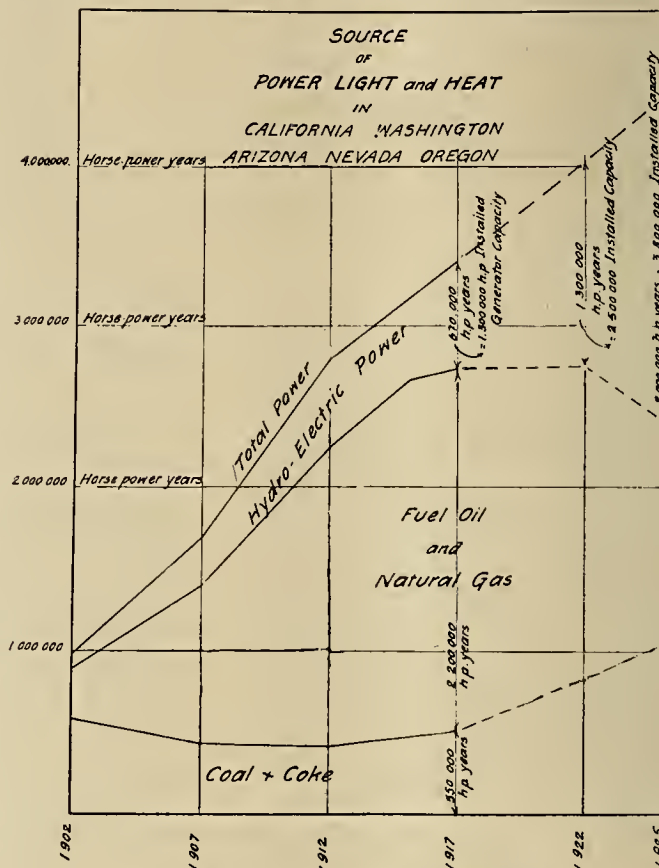
In attempting to determine the money necessary to carry out such a program of growth, it was found that when the source of power is water power, the expenditure for generation, transmission and distribution would be approximately \$8 per year for each dollar of increase of revenue.

Since the revenues of the companies of California increase from \$2,000,000 to \$2,500,000 per year, this means \$16,000,000 to \$20,000,000 new capital per year to be provided, at least for the duration of the war. The duration of the war may be from twenty days to twenty years, but when the United States Government is seen making preparations for a period of three to five years, it would appear good judgment to follow its lead and make preparations for not less than three years.

This in turn means a financial program involving \$50,000,000 to \$60,000,000, exclusive of necessities for refunding maturing obligations and for taking care of existing requirements.

The companies further face the necessity of meeting the foregoing conditions at a time of national catastrophe, when all available material, men, money, and all other human activities have been commandeered by the government and gladly given over to it.

The one certainty in the whole matter is that the requirements and responsibilities will be met. If the peace time machinery for providing materials and money has become inoperative, new machinery must be provided and the necessities taken care of.



THE DEMAND WHICH MUST BE MET

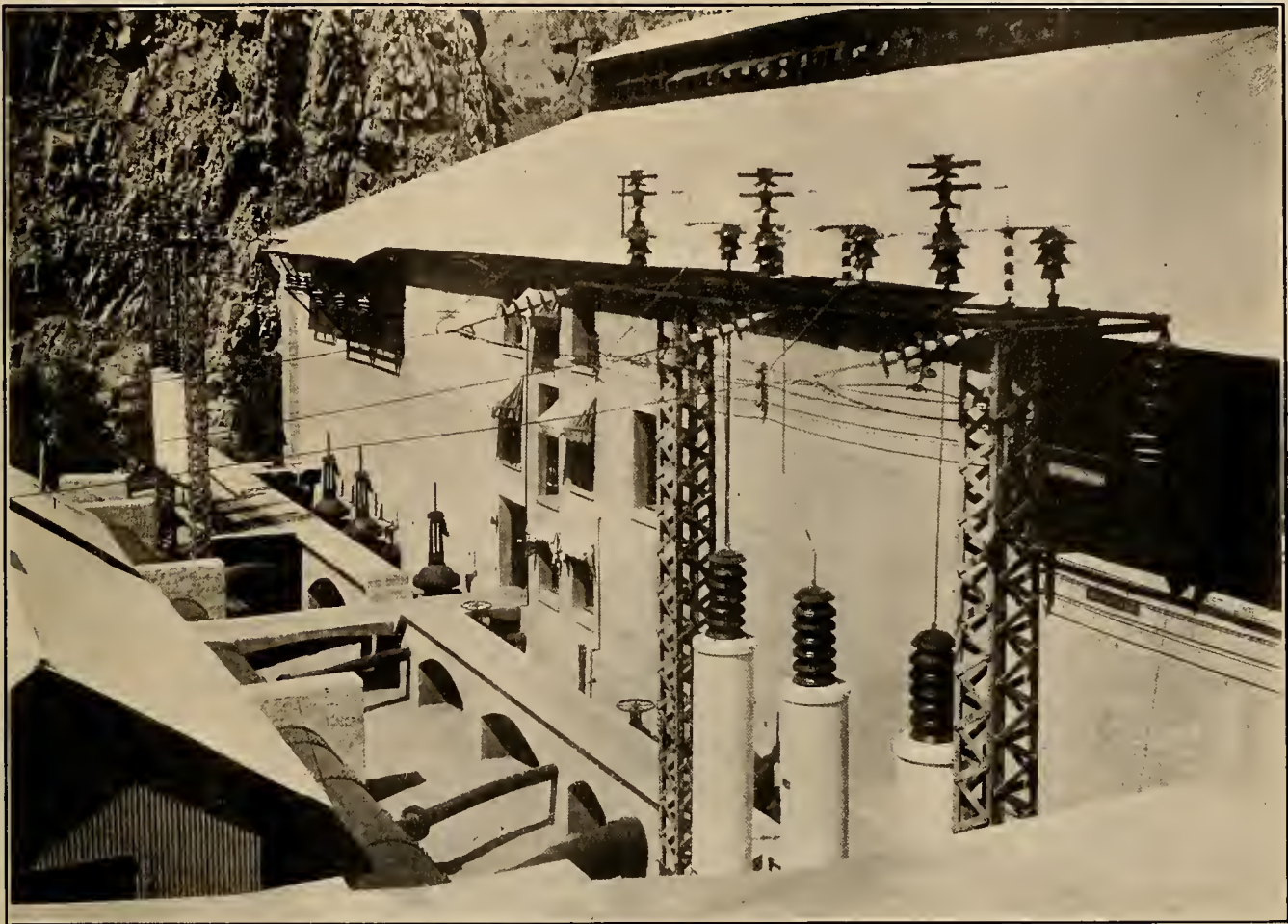
A chart worked out by D. M. Folsom, Pacific Coast Fuel Oil Administrator, which shows that in seven years' time the installed capacity in hydro-electric power must be more than doubled to meet the demand in California, Washington, Arizona, Nevada and Oregon.

Since most of what we do for the period of the war must remain with us afterward, care should be taken to see that the developments made should be those parts of the possible developments of the state which will be permanent acquisitions, and at the same time give the most power in the quickest time for the least money.



Why should we ask the other man
to pay the debt?

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KERN RIVER PLANT, SOUTHERN CALIFORNIA EDISON COMPANY

The Southern California Edison Company is planning extensions to its Kern River Plant No. 3 in the near future—and has made improvements which increase the efficiency of the Kern River Plant No. 1.

It is apparent that the first and greatest need of the power companies is more power, and that the need for conservation of fuel oil determines that this power must come from hydro-electric developments.

Some developments in Southern California now under way can be completed in the time necessary to obtain and install the necessary pipe lines and machinery which will make them available during 1919. Some other developments have progressed to the point where the engineering has been practically completed, and construction can be begun quickly, but the time required for completion will be longer. Others are in the preliminary stage and considerable time will be necessary for investigation, clearing of titles, permits and similar preliminaries before construction can be begun.

In other words, plants of the first class, like the Los Angeles Aqueduct's San Francisquito No. 2 plant, can be ready in twelve to fifteen months; extensions of the San Joaquin Light & Power Corporation's Kern canyon 20,000 kw. plant in about the same time; the Southern California Edison Company's Kern No. 3, 30,000 kw. plant, and an additional unit of 16,000 kw. in its Big Creek No. 2 plant, can be made in fifteen to eighteen months.

Of the second class, Southern California Edison Company's Big Creek No. 3 plant, 34,000 kw., is one of those on which immediate construction can begin, although the time to complete it would be twenty-four to thirty months.

The Southern Sierras Power Company, San Joaquin Light & Power Corporation, and Southern California Edison Company all have in mind other developments, more or less advanced, which can be utilized within the three-year period for meeting the state's needs.

In the territory served by the companies listed opportunity exists for the development of hydro-electric power in the next three years, as shown in table 1, following:

TABLE 1

	K.W.H. per Year.	Equivalent Barrels of Oil
1—The most immediate of these is the possibility of installing certain plants on the Los Angeles Aqueduct which are partly developed and which could be ready by 1919, capable of supplying	100,000,000	500,000
2—Edison Company has a program of development on Kern River and Big Creek for completion in 1919-20 and '21, which can supply	400,000,000	2,000,000
3—San Joaquin can construct plants on the San Joaquin and Kings Rivers, which can supply	200,000,000	1,000,000
4—Southern Sierras can complete plants to supply	150,000,000	750,000
Total.....	850,000,000	4,250,000
The total estimated cost of the proposed developments is approximately	\$30,000,000	

What would you pay that we might win the war?

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It will be seen that these permanent developments begin to have an effect on the situation, commencing at the earliest in about twelve months.

Immediate results, however, are being obtained by interconnection between all the companies of the Southern San Joaquin Valley and Southern California, although limitations and decreases in economy occur, due to the fact that the Southern California Edison Company, and the municipal plants of the city of Los

a saving of 781,000 barrels of oil, although on account of the present dry year and the fact that all the arrangements will not be in operation for a full year, the full benefit will not be obtained in 1918.

A study has been made of the diversity existing between the loads of the various Southern California companies. For the year 1917 a total diversity of 15,000 kw. was found to exist out of a maximum peak load of 238,000 kw. This in itself is worth to the co-



Angeles, operate at 50 cycles and the others at 60 cycles.

Some of the connections between the 50 and 60 cycle systems are made by means of frequency changers previously purchased, and at other points the speeds of generators are being changed from time to time to conform to the frequency of the system being supplied.

The companies affected are given in table 2.

TABLE 2

Southern California Edison Company.
Los Angeles Gas & Electric Company.
Los Angeles Aqueduct.
San Joaquin Light & Power Corporation.
Mt. Whitney Power & Electric Company.
Southern Sierras Power Company.
San Diego Gas & Electric Company.

The net results of these interconnections in a year of normal water supply would be the conservation of power amounting to 112,000,000 kwh., which, together with other measures and economies, is equivalent to

operating companies not less than \$1,000,000 when arrangements can be completed to take full advantage of it.

The high prices of equipment and money make necessary a revision of standards of service in order that the permanent burden on both the companies and the public may be as light as possible. We have willingly agreed to restrictions in our food supply, our railway service, and of our liberties in various ways, so that it is in order to get along without those refinements for continuity of service and close regulation to which we had become accustomed. We should furnish service good enough to do the job, but it is more important that 100,000 people have service 97 per cent of the time than that 50,000 people have it 99 per cent of the time, or 30,000 people 100 per cent of the time.

Generally speaking, the service of the California companies, even in peace time, has been of a particularly high grade. The same amount of money would have served a larger territory and more people with a very slight reduction in service standards. Conversely, consumers requiring a higher standard of service should pay higher rates.



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STANDARDIZATION OF PIN TYPE INSULATORS

BY L. M. KLAUBER AND R. E. CUNNINGHAM

(With the idea of reducing duplication in manufacturers' stocks, now necessary owing to the variety of practice in the use of insulators by the various distributing companies, and in consequence reducing costs and improving service, this committee was appointed to consider possibilities of the standardization of such supplies. The result of their investigations is here presented as a portion of the Engineering Committee's report to the coming Pacific Coast Section N. E. L. A. convention. The recommendations offered cover the ground most comprehensively, and form the basis for important action on the part of the association. The authors hold high positions with the engineering staffs of the San Diego Consolidated Gas & Electric Company and the Southern California Edison Company, respectively.—The Editor.)

Scope

This report covers the standardization of pin type insulators and pins for distribution circuits. This sub-committee was appointed with the idea that if standards could be agreed upon not only would manufacturers' stocks on the Pacific Coast be reduced but the standard types adopted would be more readily obtainable and at reasonable prices.

Necessarily, for commercial reasons, our recommendations must have to do with types, specifications and ratings rather than with brands and particular style numbers. However, we propose to be sufficiently specific so that if our recommendations be approved each manufacturer need provide but a single style for each voltage and class of service, and as we have further handled voltages by groups, the total number of styles required is materially limited. In addition, we have divided classes of service into two divisions based on severity of operating conditions and for each of the voltage groups under moderate conditions, we have recommended the same styles as those suggested for the next lower voltage group under severe conditions. We have been able to make our recommendations as to insulator types fairly restrictive without favoring any particular manufacturer, since all appear to put out essentially parallel lines; pins, however, are not nearly so well standardized, as several manufacturers fabricate unique types.

The term distribution is an elastic one, especially on the Pacific Coast, where our sparsely settled agricultural and mining districts require distribution lines of great extent, which in some cases assume the characteristics of transmission lines. But while some of our member companies operate purely distribution lines at 33 kv. and even higher pressures, it has been deemed advisable to limit this report to lines of 22 kv. or less, since at the higher voltages the special conditions of each case limit the possibilities of standardization.

Data Accumulated

Early in October, 1917, your committee sent out to our various member companies a questionnaire covering the investigation at hand. Complete responses have been received from thirteen companies and partial data from several more. The replies detailed first, second and third choices of insulators and pins for each voltage used, with remarks as to special operating conditions tending to affect the choice of type.

Operating Conditions

As may be expected, practice varies widely amongst the various companies. Some of this variation is due to climatic and other differences in operating conditions and these must of course be allowed for

in any scheme of standardization. Other differences, however, are merely due to lack of knowledge of what other companies are doing, and these variations it may be possible to eliminate with the co-operation of our engineering committee.

It is well known that the peculiar climatic conditions on the Pacific Coast and the wide variations in temperature, rainfall, fog, etc., met with in closely contiguous territories, require different standards for lines of similar voltage in different territories. In general, it may be said that the coast or fog belt conditions are particularly severe. Here the long rainless summer, during which the insulator becomes coated with salt and dust, and is simultaneously subjected to the moisture of fog and spray, produces a condition far more serious than the heat and dry dust of the interior valleys or the snow and sleet to which the mountain lines are subjected. So we find that nearly all companies whose lines cover both coast and interior valleys have at least two sets of specifications, one for the severe coast and the other for interior service. In line with this necessary practice, your committee has recommended separate standards for coast and interior service on lines of similar voltage.

No sharp line can be drawn in any territory to indicate where the use of the coast insulator should begin. Some companies segregate their districts by arbitrary boundaries drawn a certain distance from the coast; others learn from experience just how far inland the heavy insulators are required. In general, three to five miles appears to be the limit. High cliffs along the ocean shore which prevent spray from being blown inland bring the limit closer to the shore; on the other hand, salt marshes and sloughs carry the line further inland.

Voltage Classes

Within the voltage limits above prescribed, we find that standardization of voltages has so far progressed in our district that grouping is comparatively easy. The great bulk of the mileage operated falls within one of the following classes: (1) 2300-4000 Y, (2) 11,000, or (3) 22,000.

In addition, there are some lines operating at 6600, 13,200 and 15,000 volts. For the purposes of this report, it has appeared advisable to assign a separate 6600 volt class and to group the 13,200 and 15,000 volt lines with the 11 kv. class. This appears particularly

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theirs—

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advisable since the largest 15 kv. net work is operated by a company having an extensive 11 kv. system.

2300 Volts Delta—4000 Y—Interior Districts

Although a number of companies operating in the interior use porcelain insulators for this service, the bulk of the insulators sold in this territory for 2300 volt service appear to be D G D P glass. Porcelain unquestionably has advantages in strength and durability, yet the low price and ease in obtaining the glass insulator render its adoption advisable. Wires of 1/0 or larger are not well adapted to the D G D P insulator, and it is recommended that one of the standard cable glass insulators be adopted for this service.

2300 Volts Delta—4000 Y—Coast Districts

Some companies apparently experience no difficulty with D G D P glass insulators under coast conditions; others, where fogs are more severe, find these inadequate. It is recommended that where this is found to be the case the one-piece porcelain insulator recommended for 6600 volt interior service be used.

6600 Volts—Interior Districts

Few companies are now operating at this voltage in our territory and reports were received from only two. We recommend for this service a one-piece two-petticoat porcelain top-groove insulator with one-inch pin hole. The diameter should be about 3¾ inches, the height 3 inches, and the leakage approximately 5½ inches. Such insulators are ordinarily rated by the manufacturers at from 6600 to 8000 volts. Insulators which fulfill this specification, selected from catalogs of four prominent manufacturers, are detailed as follows:

TABLE NO. 1 Typical Insulators for 6600 Volt Service in Interior Districts				
Manufacturer.	A	B	C	D
Line voltage	8,000	6,600	6,600	7,500
Dry arcing voltage	60,000	.....	55,000	55,000
Wet arcing voltage	32,000	.....	23,000	24,000
Leakage distance	5½	5¼	5½	5½
Diameter	3¾	3¾	3¾	3¾
Height	3	3	3	3

Note: Distances are measured in inches.

6600 Volts—Coast Districts

We recommend that in these districts the insulators specified for 11 kv. interior districts be used.

11,000, 13,200, 15,000 Volts—Interior Districts

Many of the companies in this territory operate 11 kv. lines as their high voltage distribution circuits and but few at 13 or 15 kv. It would seem advisable to choose one type of insulator for these several voltages. If these be found insufficient for 15,000 volt service, it is recommended that the type suggested for 11 kv. coast service be used.

Nowhere is the desirability of specifying different types of insulators for service on the coast and in the interior better evidenced than in the reports received from companies operating at 11 kv. In almost all cases those which operate only in the interior specify styles which experience has proved to be entirely inadequate to coast service, and those which operate in

both classes of territory, with one exception, specify separate types for each condition. We recommend for interior districts a one-piece two-petticoat porcelain top groove insulator with one-inch pin hole. The diameter should be about 5½ inches, the height 3½ inches, and the leakage distance at least 7 inches. This is a small and relatively cheap insulator with the desirable strength and durability of a one-piece unit, yet with adequate electric qualities.

TABLE NO. 2 Typical Insulators for 11 kv. Service in Interior Districts:			
Manufacturer.	A	C	D
Line voltage	15,000	15,000	13,500
Dry arcing voltage	80,000	82,000	65,000
Wet arcing voltage	50,000	43,000	28,000
Leakage distance	7	8	7½
Diameter	5½	6½	5½
Height	3½	4	3½

Note: Distances are measured in inches.

A few companies have used with great success on 6600 volt lines in moderately severe districts, and on 11 kv. lines in especially favorable districts, an insulator somewhat smaller than that above recommended. Owing to the great savings effected by the employment of this design, it is recommended that its use be continued (although it is not here incorporated as a standard) in districts where it is of proved adequacy. This insulator has the following characteristics:

Line voltage	11,000
Dry arcing voltage	40,000
Leakage distance	7½"
Diameter	4¾"
Height	4½"

11,000, 13,200, 15,000 Volts—Coast Service

All companies operating 11 kv. lines along the coast, and this includes all of the largest operating companies in this territory, report the use of insulators rated by the manufacturers at 27 kv. for this service. Five companies report the use of what may be termed a "standard" type; two companies report the use of a "higher efficiency" type, with the standard type second choice. This is the lowest voltage at which the modern higher efficiency type is met. In view of the strong recommendation which these insulators are given by the manufacturers, their obvious mechanical advantages and the fact that but two out of seven companies have adopted them as standards, it would appear advisable to present at this point a general

TABLE NO. 3 Typical Standard Designs. 27 kv. Service (Manufacturers' Rating)				
Manufacturer.	A	B	C	D
Line voltage	28,000	27,000	27,500	27,000
Dry arc over voltage	85,000	80,000	98,000	85,000
Wet arc over voltage	65,000	.....	68,000	57,000
Leakage distance	11¼	13	13¾	14½
Wet arcing distance .....	.....	3½	4¼	4¾
Minimum height of pin....	7	7	8	8
Size pin hole	1¾	1¾	1¾	1¾
Net weight	4	4 2/3	6 1/3	4¾
Diameter top shell.....	8	7½	7¼	8
Diameter bottom shell....	5¼	4½	4¼	3¾
Height	6¾	6¾	7	6¾

Note: Distances are measured in inches.

TABLE NO. 4 Typical Higher Efficiency Designs. 27 kv. Service (Manufacturers' Rating)				
Manufacturer.	A	B	C	D
Line voltage	27,000	27,000	*25,000	*22,000
Dry arc over voltage.....	105,000	100,000	89,000	84,000
Wet arc over voltage.....	65,000	.....	54,000	44,000
Leakage Distance	10½	11¾	12	12
Wet arcing distance .....	.....	4¾	5	4¾
Minimum height of pin....	5	6	5¾	5½
Size pin hole	1¾	1¾	1¾	1¾
Net weight	6¾	6¼	6½	5¾
Diameter top shell.....	7½	7½	7½	7½
Diameter bottom shell....	6	5½	5½	5½
Height	5½	5¼	5¼	5¼

*Not rated at 27 kv. but directly comparable in dimensions with those so rated.

Note: Distances are measured in inches.



And you are not even asked to
give—only lend—

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TABLE NO. 5

Comparison Between 27 kv. Insulators of Standard and Higher Efficiency Types

	Standard.	Higher Efficiency
Line voltage	27,000	27,000
Dry arc over voltage.....	87,000	95,000
Wet arc over voltage	63,000	54,000
Leakage distance	13½	11½
Wet arcing distance	4½	4½
Minimum height of pin.....	7½	5½
Size of pin hole	1¾	1¾
Net weight	4 2/3	6¼
Diameter top shell	7¾	7½
Diameter bottom shell.....	4½	5½
Height	6¾	5¼

Note: Distances are measured in inches.

comparison between the "standard" and "higher efficiency" types and to examine into the relative merits of these two types. We have tabulated first the standard types for 27 kv. service of four manufacturers; then the higher efficiency type. From each table we have then taken the salient points of the two types and compared them in a third table; a diagram is likewise presented to show the general appearance of the two types.

From the above tables we deduce a comparison using composite rather than average values for each type.

TABLE NO. 7

Summary of Insulator Recommendations

No. of Class	Character of Service	Type of Insulator	Material	Leakage Distance*	Wet Arcing Distance*	Pin Hole	Diameter*	Height*
1	2300 volts del. 4000 volts Y Ordinary conditions.	DPDG	Glass	4¼	1¼	1"	3¼"	4"
2	6.6 kv. Interior Districts. 2300-4000 v. specially severe service.	One Piece	Porcelain	5½	1½	1"	3¼"	3"
3	11 kv. Interior 13.2 kv. Dists. 15 kv. Coast Districts	One Piece	Porcelain	7	2½	1"	5½"	3½"
4	22 kv. Interior Districts 11-15 kv. Coast Districts	Higher Efficiency	Porcelain	11½	4½	1¾"	7½"	5¾"
5	22 kv. Coast Districts	Higher Efficiency	Porcelain	21	7	1¾"	11"	7"

Note: Distances are measured in inches.

*Designs of different manufacturers vary slightly in these dimensions.

Of course, as operators, we are interested not so much in design as in the practical results of that design. It is not within the province of this report to discuss the technical features of the design of these so-called higher efficiency units; our purpose in presenting the above tables is to show, first, that several of the more important manufacturers are now putting out insulators of this type and, secondly, to make clear to our members by the last table the structural differences between composite examples of these types. In general it can be said that mechanically the modern small, heavy insulator is to be preferred in every way. The thick shell gives it greater mechanical strength, less liability to breakage in transit, greater resistance to cyclic temperature changes, affords a smaller target to incipient sharpshooters, and, as it requires a shorter pin, results in a cheaper and stronger pin installation. As to the comparative electrical properties of these types, a discussion of these is beyond this report. Suffice it to say that the newer designs were originally

TABLE NO. 6

Typical Designs Recommended for 22 kv. Service, Coast Districts

Manufacturer.	A	B	C	D
Line voltage	45,000	45,000	40,000	40,000
Dry arc over voltage	150,000	145,000	131,000	114,000
Wet arc over voltage.....	90,000	.....	81,000	76,000
Leakage distance	20	21¼	21½	21
Wet arcing distance	7	7	7	6½
Minimum height of pin...	7	7½	7¾	7
Size of pin hole.....	1¾	1¾	1¾	1¾
Net weight	13½	11	18	10
Diameter of top shell....	11	10½	11	10½
Diameter of bottom shell..	7½	7½	*8½	7¾
Height	7	7	6¾	6¾

*Second shell—this insulator has three parts.

Note: Distances are measured in inches.

made particularly to solve the problems of our severe coast conditions, and the success of these designs has been proved in the experience of several of our member companies operating along the coast. For further discussion of the relative values of these types our members are referred to the article by Mr. A. O. Austin, entitled "Factors Affecting Selection of Insulators," Electrical World, Volume 70, No. 19, Page 905, and the paper by the same author read before the Toronto Section of the A. I. E. E., and obtainable through the courtesy of the Ohio Brass Company.

Your committee recommends, therefore, for use on 11 kv lines, under coast conditions, a 27 kv. insu-

lator of the higher efficiency type following closely the design outlined in the right-hand column of Table No. 5.

22 Kv.—Interior Districts

The 27 kv. insulator adopted above for 11 kv. coast districts is recommended.

22 Kv.—Coast Service

A 45 kv. higher efficiency insulator is recommended. Typical products of various manufacturers are shown in Table No. 6.

Selection of Pins

Having selected insulator standards, the selection of pins becomes much simplified, since pin dimensions

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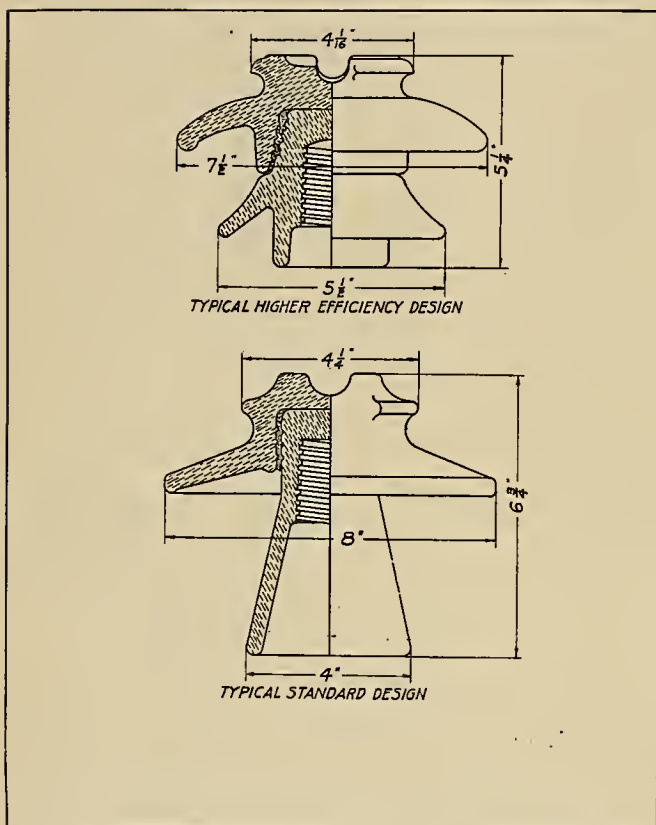
are largely determined by the insulator characteristics. The types of pins to be considered are as follows:

Type No.	Construction—
1.	All wood.
2.	Steel bolt, iron base, wood thimble.
3.	Steel bolt, iron or steel (pipe) base, lead thimble.
4.	Steel bolt, iron or steel base, C. I. cemented in thimble.
5.	Steel bolt, porcelain base, wood thimble.
6.	Steel bolt, porcelain base, lead thimble.
7.	Steel bolt, one-piece wood base and thimble.
8.	Forged one-piece steel bolt and base, spring thimble.
9.	Forged one-piece steel bolt and base, drawn steel cemented in thimble.
10.	Forged one-piece steel bolt and base, lead thimble.
11.	Forged one-piece steel bolt and base, wood thimble.
12.	Separable steel bolt and one-piece malleable iron top complete with split thimble.*
13.	Separable steel bolt, malleable iron base and malleable iron cemented in thimble.
14.	Malleable iron one-piece pin with split thimble.*
15.	Malleable iron one-piece bolt and base with malleable iron cemented in thimble.

*With or without felt insertion.

Discussion of Types

Cement is the bugbear in all insulator work. It is under serious suspicion in suspension insulator construction, and it has been proven that the less used in pin type insulators the better. To cement in an in-



Typical insulator designs—dimensions are indicated

ulator thimble is adding questionable material to the device, and furthermore a standardized screw socket which will fit a variety of pins is at once converted into a special socket which will usually fit but one brand. Your committee advises against the use of any pin engaging a cemented-in thimble. This eliminates types 4, 9, 13 and 15.

The all wood pin especially for insulators having one-inch pin holes has the advantages of low first cost, reasonable strength, and is unaffected by cyclic tem-

perature changes. With few exceptions, all of our member companies use this pin in 2300-4000 volt service, although several of those which employ porcelain insulators in such work likewise use combination pins. We recommend that the standard 9-inch N. E. L. A. pin be used with class 1 insulators. N. E. L. A. specifications should be used in making purchases, except that as locust is becoming increasingly difficult to obtain, and eucalyptus is produced on this coast and has been used with success by many of our members, it is recommended as a substitute. Sufficient data is not on hand with respect to ohia, birch, oak and other woods proposed, and we withhold recommendation of these.

All dependence for insulation should be placed on insulators, not on pins. A pin is primarily a mechanical support and to design it to act as a subsidiary insulator must invariably weaken its mechanical strength. While wood thimbles are satisfactory from the point of view of relieving insulators of stresses due to cyclic temperature changes, their performance is distinctly unsatisfactory whenever they are subjected to appreciable charging or leakage currents. This inevitably results in a digesting or charring of the wood and failure of the pin to properly hold the insulator. This condition is exaggerated in pins having steel bolts and wood thimbles, owing probably to the concentration of the electrostatic stress on a comparatively thin shell of wood. This experience has been universal amongst our member companies and need not be further commented upon. In view of the above, we recommend against the use of all wood pins, except with class 1 insulators, and against the use of combination pins containing wood for any service. Should pins of this type be returned from the lines, and it is desired to re-install them, we recommend that wood thimbles be replaced with lead. Several of our members now follow this procedure with success. The elimination of wood thimbles cuts out types 2, 5, 7 and 11.

The proposition that dependence for insulation should be placed entirely on the insulators above eliminates pins having porcelain parts. These have a high percentage of breakage and lack strength. They may be used with lead thimbles on light lines when second hand, but should no longer be purchased. This eliminates type 6.

Types 3, 8, 10, 12 and 14, being all metal devices, will give adequate service. Of these types, 8 and 14 lack the strength of the others and are not recommended for insulators having 1 3/8-inch pin holes, although their low first cost is distinctively attractive for class 2 and 3 insulators. Type 12, while more expensive than the other two, has the great advantage of a separable stud bolt which permits the use of the same head on wood or steel cross arms of any dimensions. After due consideration of these facts, we recommend for class 2 and 3 insulators a pin of types 8, 12 or 14, and of the following general dimensions:

Diameter of bolt	5/8"
Length of bolt (for 4 1/2" crossarm)	5 1/2"-6"
(Vary as desired for other crossarms.)	
Height above shoulder	4 1/2"-5"

All metal parts should be galvanized according to N. E. L. A. specification. For pins with split thimbles felt insertion is preferred.

For class 4 and 5 insulators, type 8 and 14 pins

This is history—have a share in it.



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TABLE No 8
Summary of Pin Recommendations

Class of Insulator	Character of Service	Type of Pin All Metal Parts to be NELA Galv.	Size of Thread	Height above Arm	Diameter of Base	Size of Bolt	Length of Bolt
1	2300 volts Delta 4000 volts Y Ordinary conditions	Wood, Locust or Eucalyptus	1"	5"	1¾"	1½"	4"
2	6.6 kv. Interior Districts 2300-4000 Y specially severe service	Forged one-piece steel bolt and base spring thimble, or Separable steel bolt and one-piece malleable iron top complete with split thimble, or Malleable iron one-piece pin with split thimble.	1"	4½" to 5"		5/8"	5½" to 6"
3	11-15 kv. Interior Districts 6.6 kv. Coast Districts	Forged one-piece steel bolt and base with lead thimble, or Separable steel bolt and one-piece malleable iron top complete with split thimble, or Steel bolt, iron or steel (pipe) base, lead thimble. (Home-made.)	1¾"	5¾" to 6"	3"	5/8"	6" to 6½"
4	22 kv. Interior Districts 11-15 kv. Coast Districts		1¾"	7½" to 8"	3"	5/8"	6" to 6½"
5	22 kv. Coast Districts		1¾"				

Note: Distances are measured in inches.

are too light; type 3, 10 and 12 pins are to be preferred, and of these three, the best standardized types are numbers 10 and 12. However, type 3 is a style which any company can easily fabricate locally, and for this reason must be given consideration. Of the two former types, number 10 has the advantage of strength, while number 12 is to be preferred on the score of first cost and adaptability of separable bolt. Type 10 is usually standardized with a ¾-inch bolt. We recommend against this size and in favor of a 5/8-inch bolt, as this has ample strength when used with these sizes of insulators and wood crossarms and will permit the use of arms with drilling similar to those used with smaller insulators. For instance, by standardizing on the 5/8-inch bolt, companies operating 11 kv. lines in interior districts and along the coast will require but one standard crossarm for lines of this voltage, where otherwise two would be necessary. As to the height of pin above the shoulder, class 4 insulators require at least 5¾-inch, while class 5 requires at least 7½-inch. It may also be noted that the older "standard" insulators, corresponding with class 4 service, required pins 7½-inch above the shoulder. We therefore suggest that companies operating 11-15 kv. lines use pins 5¾-inch to 6-inch above the shoulder, while those operating 22 kv. lines or expecting to replace large quantities of pins on lines insulated with old standard class 4 insulators, use pins 7½-inch to 8-inch above the shoulder. We recommend that bolts be 6 to 6½ inches long. The diameter of the base should be not less than 3 inches to afford a good bearing area to resist bending. As in the smaller class, all metal parts should be galvanized according to N. E. L. A. specifications, and insulators with split thimbles should be furnished with felt insertion.

TELEPHONE SPECULATION IN JAPAN

The number of telephone instruments installed in Tokyo is 45,000, according to the Japan Times. These are handled by several different exchanges, each of which has from 2000 to 7000 numbers under its supervision.

The number of persons who have applied for installations is now 60,000, and will continue to increase. An official of the department of communications has stated that the authorities are of the opinion that it will be possible to satisfy every one of these applicants within ten years, not a very brief period.

There are many reasons why the telephone system of Japan has so much trouble in meeting the demand. In providing for the expense consideration must be given to the time best suited for the flotation of loans. Thus it is impossible to obtain the capital at will, and work is postponed whenever the money market is hard. There is also the question of employees. Since the work involves the handling of delicate mechanism, experience and efficiency are necessary before the workman can do the work satisfactorily. The shortage of hands naturally delays installation. The exchange apparatus used in Japan is imported, and being made for foreign operators, is rather too high or too wide for the Japanese telephone girls, so that their full working capacity can not be attained.

Tokyo is not the only place where private telephone dealers are active, and they may be seen in all the large cities of the country, especially in Osaka, where prices even higher than in Tokyo are often quoted. Today a good call number costs more than 1000 yen (\$498.50), while the minimum may be said to be about 750 to 800 yen (\$374 to \$399).

The authorities have expressed regret that the ratio of telephones to population in Tokyo is only 2 to 100, and are exerting efforts to remove the evil. They ask the nation to wait some years longer, when the demand, they believe, will be amply supplied. They think that by 1929 everything will be made right.

Are you going to accept charity
from the boys who fight?

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IRON AND STEEL CONDUCTORS

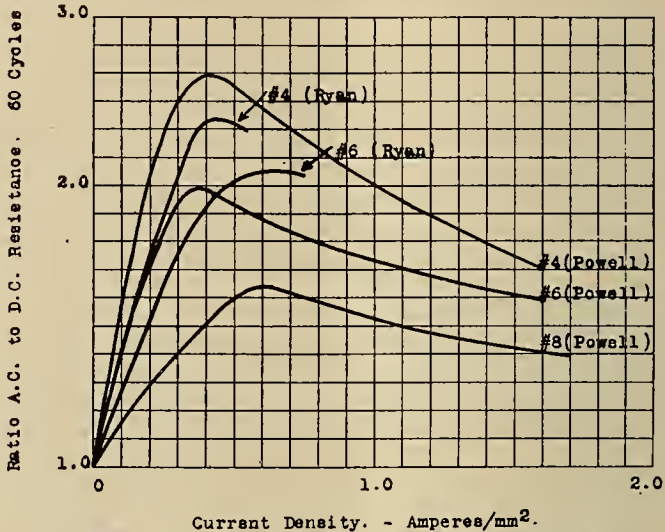
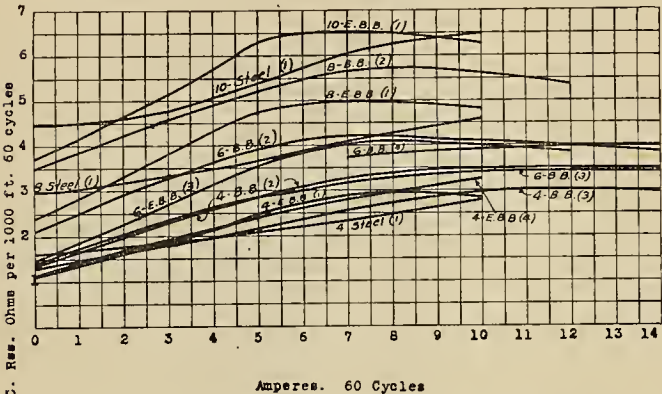
BY R. C. POWELL

(The scarcity of copper, owing to war conditions, has led to the use of iron and steel wherever the substitution is possible. The application of these metals as conductors has created a new situation for the power expert with a new set of problems to be solved. This analysis of the situation, with the results of experiments to date, as presented by the Engineering Committee for the coming convention, is therefore of particular timely interest. The author is electrical engineer with the distribution department of the Pacific Gas & Electric Company.—The Editor.)

The present abnormal conditions and consequent serious effect upon the price and supply of copper and aluminum have brought into prominence the use of iron and steel conductors.

The purpose of this report is to gather together data on the physical properties and economic use of iron and steel conductors, together with extent and

be made to go into the complicated theory of change of resistance of iron for alternating currents, as all the practical information needed may be very simply obtained from test data.



- (1) - Miller, Bull. Bureau of Standards Vol. 12 No. 2 p. 207
 - (2) - Powell, Tests by Laboratory Pac. Gas & Elec. Co., San Francisco
 - (3) - Ryan, Elec. Review Vol. 71 p. 496 Sept. 22, 1917.
 - (4) - Worcester, Gen. Elec. Rev. June 1916.
- Change of A. C. resistance with current—Fig. 1

use and results thus far obtained by Pacific Coast member companies. There are four grades of iron and steel to be considered, E. B. B. and B. B. iron, ordinary gu y and Siemens-Martin steel.

Change of A. C. resistance with current density—Fig. 2

Electrical Conductivity

For iron and steel there is a marked variation of alternating current resistance with the current and frequency. An alternating current is forced to the surface of the conductor, thus cutting down the effective area and thereby increasing the resistance resulting in the so called "skin effect." This effect increases with

TABLE I
D. C. Resistance and Mile-Ohm

No.	Wt. per Mile	Miller (1)		Powell (2)		Reported By Ryan (3)		Worcester (4)		Roebbling (5)
		Ohms Per Mi.	Mile-Ohms	Ohms Per Mi.	Mile-Ohms	Ohms Per Mi.	Mile-Ohms	Ohms Per Mi.	Mile-Ohms	
4 EBB	811	6.08	4940					6.08	4940	4600 to 5000
6	590					7.9	4650			
8	390	12.4	4840							
10	258	19.2	4960							
4 B. B.	811			7.4	6000	7.1	5760			5000 to 6000
6	590			10.	5900	9.0	5300			6000 to 7000
8	390			17.8	6950					
4 Steel	811	8.6	6980							
6	590	15.6	6080							
8	390	23.7	6100							
10	258									

Physical Properties

The three physical properties of interest are electrical conductivity, strength, and durability. It is to be particularly noted that for iron and steel there is for all three properties considerable variation among individual samples. It is therefore not advisable to attempt to check constants by comparing the various tests reported. For this reason, also, no attempt will

- (1) Bulletin Bureau of Standards. Vol. 12, No. 2, p. 207.
- (2) Tests by Laboratory, Pacific Gas & Electric Co., San Francisco.
- (3) Ryan, Elec. Review, Vol. 71, p. 496, Sept. 22, 1917.
- (4) Worcester, Gen. Elec. Review, June, 1916.
- (5) Wire in Electrical Construction. Published by John A. Roebbling's Sons Co.

frequency and magnetic permeability, being zero for zero frequency (direct current) and small for non-magnetic materials (copper, aluminum, etc.) at commercial frequencies.

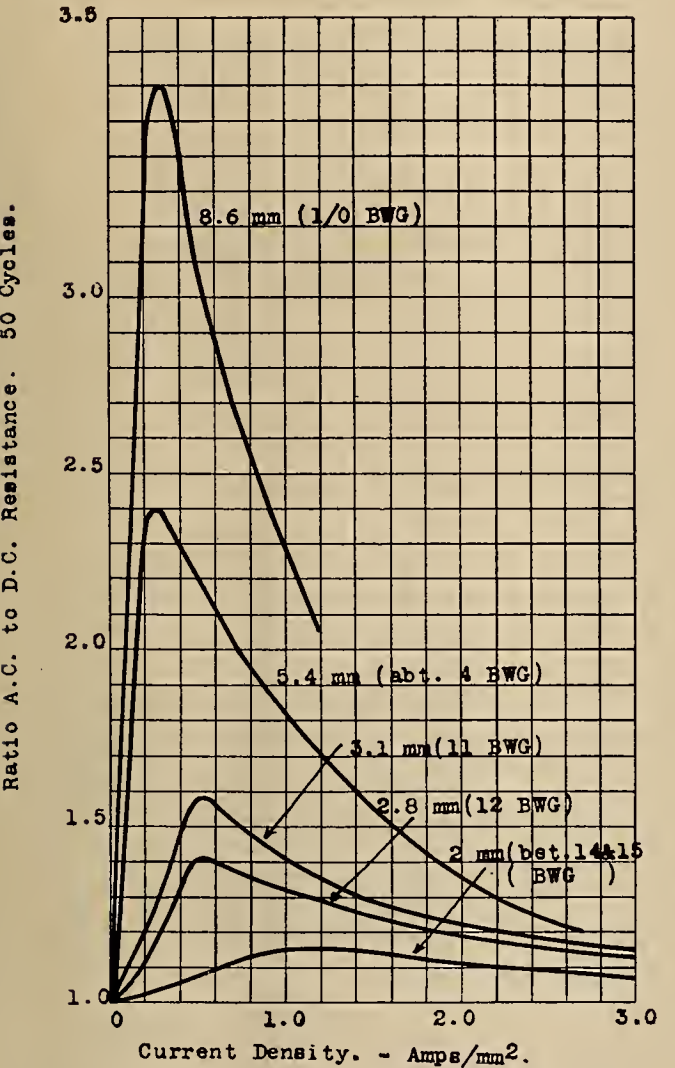
Fig. 1 gives some test results as reported by various observers. Table I gives the D. C. resistance per mile and the mile-ohm (resistance per mile times pounds per mile), and shows what values may be expected.



Suppose it were "over here"?

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Fig. 1 shows the very considerable change of A. C. resistance with current, and the fact that this change is greater for the larger sizes. This is shown better by the curves in Figs. 2 and 3, which give the ratios of A. C. to D. C. resistances varying with current density.



Change of A. C. resistance with current density—Fig. 3

In Table 2 is given the mile-ohm for different amperes for B. B. iron. At 10 amps. the mile-ohm for No. 6 is 10 per cent greater than for No. 8, and that for No. 4 is 49 per cent greater than for No. 8 and 25 per cent over that for No. 6.

In order to make a proper comparison of the change of A. C. resistance due to size, wires having the same D. C. resistance should be taken. The table has been made up by assuming the mile-ohm for B. B. iron to be 6000 and multiplying the corresponding D. C. resistances by the ratios given in Fig. 2.

The curves in Fig. 3 are taken from the Elektro-technische Zeitschrift of January 28, 1915. The D. C. resistance given corresponds to 6800 lb.-ohm/mile² and the strength 62500 lbs./sq. in., or the material as regards D. C. resistance and strength is about the same as our ordinary steel guy.

The results given in Figs. 2 and 3 show the impracticability of using large solid conductors as alternating current conductors.

Stranded Conductors

Fig. 3 shows very nicely in a general way the influence upon skin effect of increase in diameter and also that conductors of small diameter show very little skin effect at commercial frequencies. The current

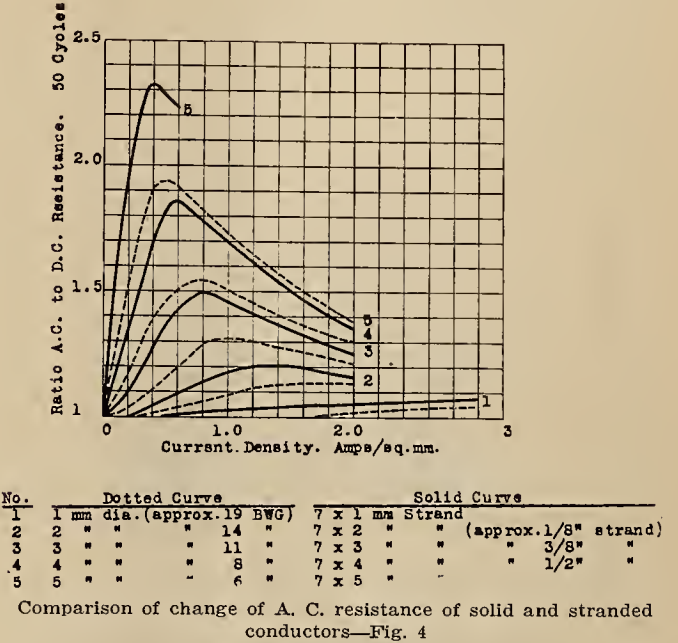


TABLE II						
Mile-Ohm for B. B. Wire						
Size:	No. 8		No. 6		No. 4	
Amp.	Current Density Amps/mm²	Mile-Ohm	Current Density Amps/mm²	Mile-Ohm	Current Density Amps/mm²	Mile-Ohm
0	0	6000	0	6,000	0	6,000
2.5	.19	7600	.137	9,300	.095	9,300
5.0	.375	8800	.27	11,300	.195	12,200
10.0	.75	9600	.535	11,400	.39	14,300
15.0	1.13	8900	.8	10,800	.585	13,700
20.0	1.5	8500	1.07	10,300	.78	12,800

tends to follow the individual strands so that a stranded conductor has a much lower A. C. resistance than a solid one of the same weight and area. However, increasing the area by stranding does not decrease the resistance proportionately, that is, the resistance of a seven-strand conductor is considerably more than one-seventh that of an individual strand.

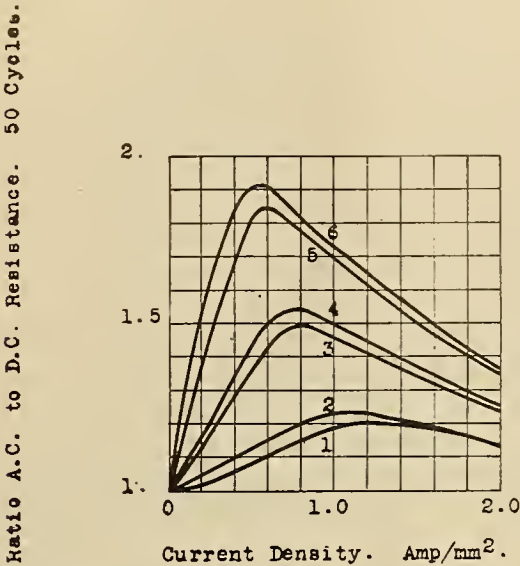
These points are brought out in Figs. 4, 5, 6 and 7, and are taken from the Elekt. Zeit. previously referred to. Figs. 4, 5 and 6 are for steel having a strength of 100,000 lbs./sq. in. and Fig. 7 for steel of 62,500 lbs./sq. in. Fig. 4 shows the increase in resistance due to stranding, on the basis of equal current density, for seven-strand cables. Fig. 5 brings out the point that a small steel cable is more economical in material than a large one and a seven-strand cable more economical than a 19-strand for any given size of strand.

The curves in Figs. 6 and 7 were drawn to show even more clearly the effect of reducing the size of strand. Here a solid wire, a seven-strand and a 19-strand cable, all having approximately the same area

It's not only one nation, but humanity—

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and weight, are compared. Fig. 7 brings out still more clearly perhaps the marked advantages of stranding. The two sets of curves compare a 1/0 B. W. G. solid and a 3/8-in. (approximately) cable made up of seven strands of No. 11 B. W. G., or 19 strands of No. 14 B. W. G. at 50 cycles.



No.	Stranding	Approx. Size Strand.
1	7 x 2 mm	1/4"
2	19 x 2 "	"
3	7 x 3 "	3/8"
4	19 x 3 "	5/8"
5	7 x 4 "	1/2"
6	19 x 4 "	7/8"

Effect of stranding upon A. C. resistance—Fig. 5

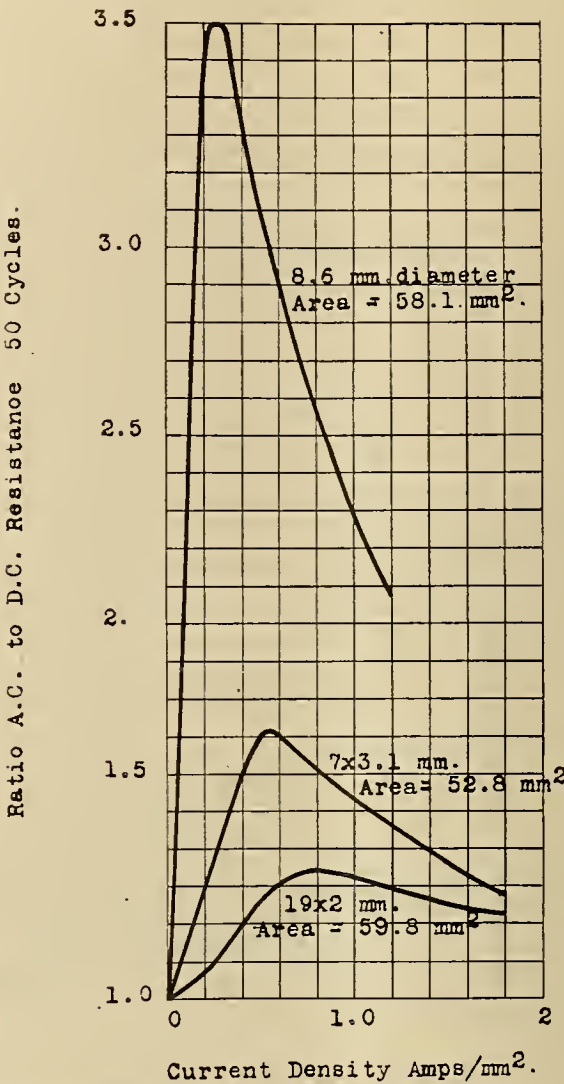
In Fig. 8 are given the results of tests on stranded wire and steel conductors. There is some variation in the data as reported by the various observers, but for the most part the general characteristics are similar. This is shown better in Fig. 9, where the ratio of A. C. to D. C. resistance is plotted against current density.

The ratio of resistance to reactance for iron and steel conductors is very high, the power factor of the line under short circuit being 90 to 95 per cent, so that the variation in voltage drop, due to the power factor of the load and spacing of conductors, is of no practical importance. Therefore, for all ordinary purposes the power factor of the load may be taken as unity.

The voltage drop diagram (Fig. 10) is based on resistance drop, unity power factor and the curves in Figs. 1 and 8. Those curves being taken which give the highest values.

The key to the use of this diagram is shown in the lower right-hand corner. As an example, find the voltage drop due to a 5 amp. load on a 3 mile, 3 phase (or, 1.5 mile single phase) circuit of No. 6 iron. Follow the vertical 5 amp. line to its intersection with the dotted horizontal 3 mile line. Thence, follow the

diagonal line through this point to the intersection with the horizontal line through the intersection of the 5 amp. vertical line and the "6" curve. Thence along the vertical line through this point to the volt scale at the bottom, in this case 300 volts.



Comparison of solid wire 7 strand and 19 strand cables of approximately equal areas—Fig. 6

Strength

Among the values for mechanical strength there is as much variation as those for electrical resistance. However, conservative and safe values for the ultimate strength may be taken as:

55000 lbs./ sq. in. for E. B. B., B. B. and ordinary steel guy.

75000 lbs./ sq. in. for Siemens-Martin.

The elastic limit may be taken at 50 per cent of the ultimate strength E. B. B., B. B. and ordinary steel guy may be considered as having about the same strength as hard drawn copper.

Corrosion

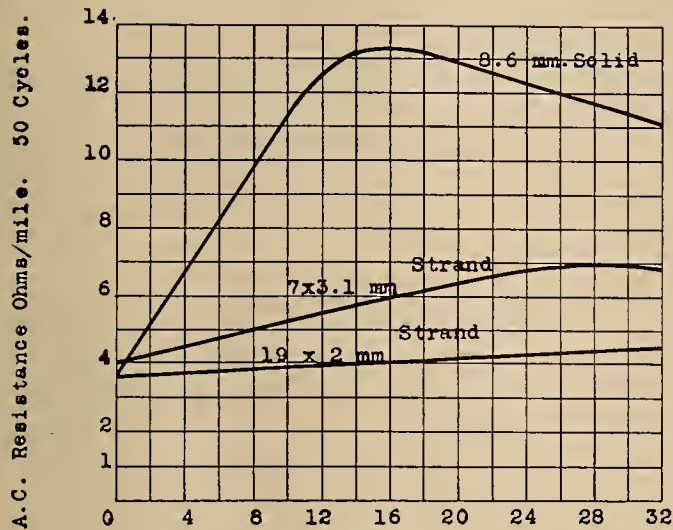
It is well know that iron, and particularly steel, corrodes much faster than copper. Excessive corrosion is apt to be experienced on lines crossing salt marshes or located so as to be subjected to salt fogs or mist. It is doubtful if it is advisable to install any but double galvanized steel conductors, excepting in very dry climates. Stranded conductors, in particular,



There is no cleaner cause.

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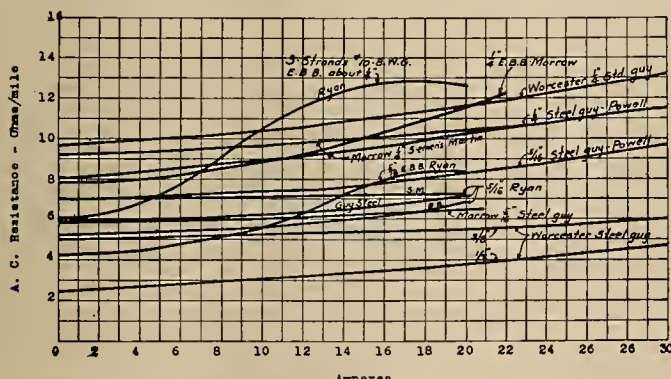
are liable to short life unless well galvanized, due to corroding of the small wires. This form of corrosion is, of course, simply the usual oxidation of iron and steel which is always greatly accelerated by the presence of moisture and salt.



Amperes.
Approximates 3/8" steel strand at 50 cycles.
Comparison of solid wire, 7 strand and 19 strand cables of approximately equal areas.—Fig. 7

There has, however, been discovered corrosion of iron and steel conductors on high-voltage lines which is quite apart from the usual corrosion just discussed.

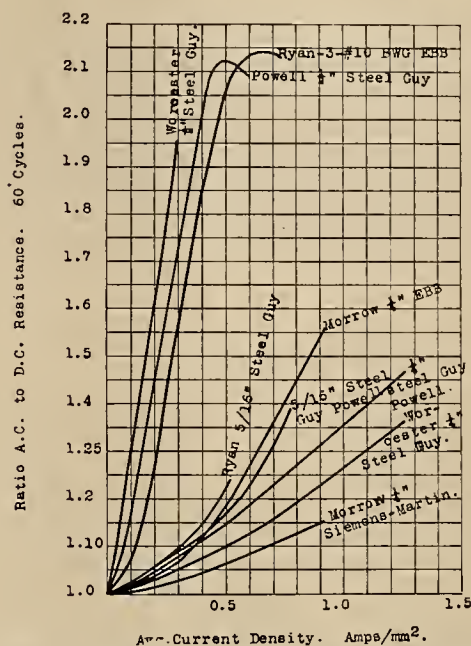
Figs. 11, 12 and 13 show the effects of this form of corrosion on a steel 60 kv. line. This line was installed about 11 years ago and the 3 conductors were 3/8-in. steel guy. The 6 miles of this line were in good condition, excepting at 80 or 90 insulators, which were more or less in the condition shown by the photographs. Fig. 11 shows the corrosion of the conductor, and Fig. 12 that of both the conductor and tie wire,



Change of A. C. resistance of stranded conductors with current.—
Fig. 8

which was iron. It is seen that the tie wire is completely destroyed, for a distance on one side, and three or four wires of the conductor are corroded through. Fig. 13 shows very clearly why the corrosion should be so severe at only certain points. It will be observed that just underneath the badly corroded portion of the wire is a fine crack in the insulator. Corrosion was found only at cracked insulators and localized at the crack. The cause is undoubtedly due to excessive corona at the cracks, producing small quantities of nitric acid, which attacks the steel.

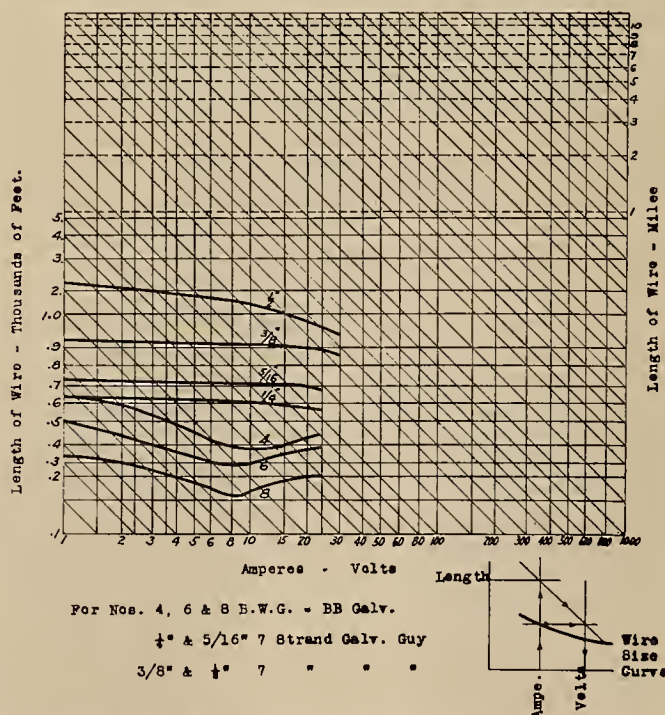
The writer is indebted to Mr. J. P. Jollyman, Pacific Gas & Electric Company, for the information regarding this interesting case of corrosion.



Change of A. C. resistance of stranded conductors with current density—Fig. 9

Use of Iron and Steel Conductors

From the data above presented, it seems that it is advisable to use solid conductors only for very light loads, in general not over 3 amperes. The great increase of resistance with current produces very poor



Voltage Drop Diagram for iron wire (ohmic drop only)—Fig. 10

You can't stay out of it—choose
your sides.

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REPLIES TO QUESTIONNAIRE

Co.	No. Mi. Wr. All Sizes (Approx.)	Voltages Kv.	Class of Service	Span		Data Given for Certain Lines				Distance, Miles	Remarks
				Avg.	Max.	Volts	Size	Grade	Load Kva.		
1		22	Brnch. pr. lines		200		No. 4 1/4"	S&M	100 225		
2	Over 70	6.6 and 66	6.6 kv. rural serv. 66 kv. extens'ns			66 66 66	3xNo.10 3xNo.10 No. 8	BB Standard BB Standard EBB	150 1400 750	17.7 2.9 2.7	Satisfactory.
3	4	2.3 and 6.6	Short ext. for small power				No. 10	Iron W. P.			Do not consider iron practicable, account of poor voltage regulation.
4		11	Suburban distribution				No. 4 & 6	EBB			Not satisfactory. Excessive sag from overheating due to excessive load account not being able to arrange interruption to change to copper.
5		2.2 and 10	Short ext. for small power				1/4"	Steel Guy			Some years ago attempted to use second-hand No. 4 WP for 2.2 kv. and 10 kv. lines. Found necessary to remove account excessive drop on 2.2 kv. lines and hazard on 10 kv. lines short circuits annealed wire resulting in abnormal sag or loss of strength.
6	Over 300	2.3 to 60	60 kv. br. lines	300		60	1/4"	S&M	400	57	Supplies four towns.
			6.6 kv. rural distribution			60	1/4"	S&M	200	14	Supplies small town.
			2.3 kv. city primary extens'n	200		60 60	1/4" 1/4"	S&M S&M	400 350	5 10	Irrigation.
											Transmission line in sleet zone. Supplies two towns.
						6.6	No. 4	BB		5 to 16	Supplies small towns.
						6.6	No. 6	BB			Branch rural lines. Some trouble with voltage regulation, and regulators had to be installed. In certain cases load refused because could not be carried on existing iron lines.
7		13 and 50	Coal mines and suburban distribution	138	196	50 13	1/4" 9	Steel Guy BB	1000 75	14 75	Satisfactory.
8	Over 300	2.5 and 11	Short ext. for small loads	700	1000		1/4"	Steel Guy			Loads: up to 400 kva. on 11 kv. circuits.
		and 60	Short rural feeders with small load	700	1000		5/16" 3/8"	Steel Guy Steel Guy			Loads: up to 75 kva. on 2.5 kv. circuits.
			Service lighting circuits		350		1/4"	Steel Guy	6.6 amp.		40 ft. poles used for 700 ft. spans and on important highways 45 ft. poles.
			Long spans in transmission lines	1762	3379		3/8" or 7/16"	High Strength			For long spans triangular construction employed, using steel pole top pin.

regulation. For example, the drop per mile of wire for No. 6 B. W. G. for 1 amp. is about 13 volts and for 3 amps. about 52 volts or 4 times instead of 3 times the drop for 1 amp. At 7 amps. the drop is 155 volts or 12 times the drop for 7 times the current. This effect is not so noticeable for stranded conductors up to and including 3/8-in. But, unless special stranding is employed, 1/2-in. and larger sizes show greatly increased resistance with current. The extra cost and difficulty of obtaining special strand limits the economic use of iron and steel to lines carrying small currents.

There are, nevertheless, a number of applications for this material, particularly at the present time. Some of these are:

1. For supplying small loads where size of copper required for mechanical reasons is much larger than demanded on account of line loss or regulation.

2. For short primary services, and in case of short distances and light loads even 2300 and 4000 volt services, especially in agricultural districts where load is seasonal.

3. To supply temporary industries or construction work from 11 kv. or higher voltage lines. Many of these loads, ship-building plants, etc., are coming on now which will be discontinued at or shortly after the conclusion of the war.

4. Extensions of 11 kv. or higher voltage lines in agricultural and country districts to take on small loads with little or no prospect of increase.

5. Country extensions of 11 kv. or higher voltage lines where it is considered that steel strand will take care of demands for three or four years, and that difference in future and present price of copper will pay for change to copper



Think what the spectacle of cheerful giving means to the enemy.

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Fig. 11



Fig. 12



Fig. 13

CORROSION OF HIGH TENSION STEEL CONDUCTORS

A form of corrosion due usually to cracks in the insulator. Fig. 11 shows corrosion of the conductor. In Fig. 12 both the conductor and tie wire are eaten through. Note in Fig. 13 that a fine crack in the insulator shows just below the badly corroded portion.

three or four years hence. Or, where difference in present and future financial conditions render it advisable or necessary to construct lines as cheaply as possible, even with the knowledge that copper would be more economical.

The greater strength of steel over copper enables savings to be effected in the cost of supports by increasing the span. If the span is increased where the load within a few years will probably require copper, it is well to consider making the span double that used for copper.

In order to obtain some information as to the extent of use and results of operation of iron and steel conductors, a questionnaire was sent out to companies operating on the Pacific Coast.

The replies received are tabulated above. It is to be noted that causes of unsatisfactory operation are:

- (1) Poor regulation, and
- (2) Excessive sag, caused by short circuits or overload, only, however, in cases where solid wire was used.

ELECTRICITY IN LOGGING AND SAW MILLS

In a recent issue of the General Electric Review, E. H. Horstkotte points out that with an ever increasing demand for lumber and the necessity of logging in the more inaccessible places in our forests, there has been a continually increasing cost in bringing logs to the mills. Increased demand for lumber called for a more rapid and cheaper method, and as a result the powerful steam donkey was developed. Superseding this there came the electrical logging engine which, after five years of the most conclusive tests, has proven that where electrical energy can be transmitted at a reasonable cost, it is as superior to the steam donkey as the steam donkey is to animal power.

Performances of the electric donkey taken during the past few years have shown that when compared with other methods of logging, the electrically driven outfit will handle logs at a decreased cost per thousand feet and at an increased rate per day. It also has the following distinctive features:

Will safely withstand the severe service to which it is subjected.

Can transport itself through the woods.

No fires to build or water to haul.

No wood to cut and consume, using timber which could otherwise be converted into a commercial product.

No boilers to freeze or explode.

Eliminates sparks, which are the source of many forest fires.

The power is usually transmitted at 11,000 or 22,000 volts from the generators located at the mills, where there is always an abundance of cheap fuel, to a portable substation located in the area which is to be logged.

After a decade of operation, often under most severe service conditions, the electric drive in saw mills has proven its value whether in the cutting of the giant firs of the Pacific Coast, the pines of Minnesota and the Rocky Mountain states, or the hard woods of the South.

In a modern electrically driven sawmill, the non-condensing engine has been supplanted by a high-speed, highly efficient condensing steam turbine, this change resulting in a great saving in boiler capacity, steam consumption, and floor space. All line shafting and large belts are practically eliminated, thus removing many obstructions to the lighting, and allowing a better distribution of machinery, with a marked reduction in the construction cost. The elimination of a large number of bearings reduces the fire hazard from hot boxes, which has a very noticeable effect upon the insurance rates.

A comparison of the quantity of oil required by steam and electrically driven mills of the same capacity shows that there is a large saving in this item. In fact, a comparison of the operating costs of a large number of steam and electrically driven mills shows that there is a decided reduction in the cost of operation of the latter. This can be accounted for by a reduction in the number of millwrights, oilers, and helpers about the mill; saving in renewals of worn-out bearings, belts, etc.; oil, minimum number of shut-downs due to breakdowns, a constant rate of production throughout the entire mill, and lower insurance rates.

For service outside the mill storage battery locomotives, motor-driven transfer cars, mono-rail cars, and traveling cranes have been developed, each having its particular advantages for different installations. All of them are successfully driven by electric motors.

Think—if we should fail?

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POWER PLANT LOSSES

BY R. J. C. WOOD

(To save is to serve—with this in mind, the power companies of the West have worked toward interconnection of power lines and efficiency in operation as the greatest war service which they may perform. A detailed survey of the saving possible in the power plant itself, as well as an analysis of the larger problem, is forcefully set forth here. This paper, which is presented by the superintendent of power of the southern division of the Southern California Edison Company, is one of a group of powerful discussions offered by the Engineering Committee for the coming Pacific Coast Section, N. E. L. A., convention.—The Editor.)

The theory of the conservation of energy, as defined by physicists, is that energy is indestructible, changing in form but never in quantity. Such a definition, while no doubt rigorously correct, neither conveys the popular conception of the matter nor the subject of this paper.

What we have to deal with in commercial engineering and operation is the utilization of our sources of energy with a minimum of waste. We are concerned in seeing that our energy does not change into forms that are of no commercial use. The possible sources of waste in a hydro-electric generating plant may be classified as follows:

1. Loss of flood water due to insufficient storage facilities.
2. Loss of flood water due to any reduced carrying capacity of canal and pipe lines.
3. Loss of water under diversion dams.
4. Leakage from canal and pipe lines.
5. Overflow of spillways.
6. Friction losses in pressure mains.
7. Failure to utilize all the available head.
8. Water wheel losses due to poor design of buckets and nozzles, or wear of the same and interference with tail race water.
9. Unsuitable number of machines in operation.
10. Station light and power including camp use.

The storage facilities of the Southern California Edison Company are located upon Big Creek, the initial construction of dams affording a storage of 51,600 acre feet in Huntington Lake. With this amount of storage, and assuming a market for all the power, a total of 156,000 acre feet would have been unavoidably wasted during the years 1910 to 1916, inclusive, as overflow during the run-off period, the total run-off being 789,000 acre feet. The dams were raised last year, increasing the storage to 88,400 acre feet, and with this capacity the overflow waste would have been reduced to 83,000 acre feet, or 10.5 per cent of the total run-off. The saving of 73,000 acre feet corresponding to about 230,000,000 kwh. or 885,000 barrels of fuel oil.

Further conservation of water is possible in this project by the driving of tunnels which will increase the area of the watershed draining into Huntington Lake, and by building dams in the higher levels, increasing the total storage.

Loss of flood water has been experienced particularly in our Mill Creek plants due to the growth of

hellgrammites in the gravity canal. These little animals form a sheath of leaves and small particles of debris, cementing it around themselves, and they attach themselves to the sides of flumes, tunnels and pipes. The Mill Creek gravity line is of 36-inch concrete pipe with steel syphons where canyons are crossed. The normal carrying capacity of this line is 25 second feet, the grade being 2 feet per 1000.

With the accumulation of hellgrammites the capacity of this pipe has been reduced to 21 second feet. Our station chief has devised a pipe sweeping machine which is pulled through the conduit by a rope. This effectually removes the hellgrammites and restores the carrying capacity. Fortunately, these accretions on the pipe only exist at its upper end, rarely extending more than a mile down from the intake.

In favorable seasons where heavy rains occur at the beginning of the rainy season, the sand carried in suspension in the water causes the hellgrammites to "let go," but in seasons where no large amount of flood flow occurs, recourse must be had to pipe sweeping.

In our Lytle Creek plant where there is a four-mile 20-inch concrete pipe conduit, the station chief has achieved good results by tying up a bundle of brush and slipping it into the pipe at a manhole; the water carries the bundle along with it, sweeping as it goes.

Our smaller hydro-electric plants have diversion dams which do not go to bedrock, as it would entail a relatively tremendous expense to cut off the under flow in this way. A portion of this otherwise wasted water has been saved at Lytle Creek by the sinking of a shaft and installation of a centrifugal pump run by a 100 horsepower motor. This installation was effected in co-operation with the water company, and they obtain an additional six second feet which increases our generating output by 180 kw., so that after deducting the power required to run the pump there is a net gain of about 90 kw. or 66,000 kwh. per month, equivalent to 250 barrels of oil.

Leakage from concrete pipe lines has nearly always been found at the joints, roots of trees having penetrated and forced open the joint. Such a leak from a buried pipe, if of small amount, is hard to find, the best indication being the extra luxuriance of the floral surroundings.

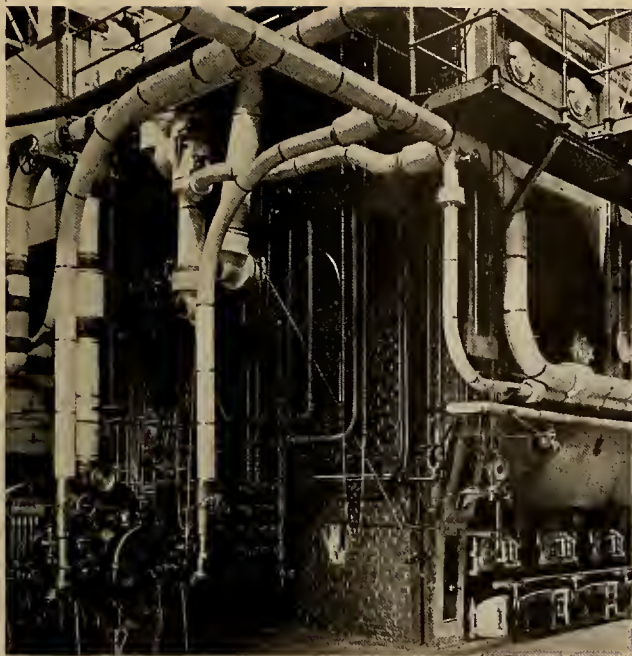
Regarding the overflow from spillways, this is a fruitful source of difference of opinion between operators, superintendents, and water companies. We have found a graphic water level recorder to be the best cure.

Friction losses in pressure mains are usually beyond the control of the operator except as to occasional internal inspection to determine their condition.



Are you merely a stow-away—or
do you pay your way?

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ECONOMY MEASURING APPARATUS—1

To save in the boiler room the soot should be carefully blown from time to time and an accurate record kept of the various factors that lead to a knowledge of the state of combustion in the furnace. In the view to the left is shown a soot blower installation, while to the right may be seen meters for recording the draft, temperature of chimney gas leaving the boiler, feed water temperature, carbon dioxide (CO₂) in the chimney gas, and temperature of the chimney gas leaving the economizer. One set of this apparatus is provided for each pair of boilers at the Long Beach Plant of the Southern California Edison Company.

Failure to utilize all available head is also chiefly a matter of original design, although some small economies may sometimes be effected by the use of flash boards at spillways. At our Kern River No. 1, for instance, the spillway was raised two feet, adding 32,000 kwh. per month.

In the older plants there are many possibilities of increasing the efficiency by equipping them with modern nozzles and buckets. This, however, requires an expenditure which in most cases cannot be incurred under present conditions. The output of our Santa Ana River No. 1 plant was increased in this way from 2200 kw. to 3600 kw., not that this was all due to increased efficiency, as the new buckets and nozzles were larger than the old ones, permitting of greater output. At Kern River No. 1 a change of buckets and nozzles made by the original builders of the wheels raised the efficiency from 82 per cent to 85.5 per cent. This indicates the advisability whenever ordering a new set of buckets to replace worn out ones, of giving the manufacturer a chance to supply an improved type.

Flooding of impulse wheels by tail race water can sometimes be remedied by the operator, but is mostly a fault in design.

Where less than full load water is available, it is important to cut down the number of units so that those in operation may be economically loaded. We have noted a gain of 50 kw. when one out of four 750 kw. units has been cut out in one of our smaller plants, the losses of one unit being eliminated.

Under the head of station light and power, we include all electricity used for lighting and heating camp cottages. This requires constant supervision, and we are seriously considering the metering of each individual house in camp. In Mill Creek No. 2, 3, we formerly had two water-wheel driven exciters, and although the nozzles were as small as they could be consistent with freedom from plugging, there was a waste

of water; recently an induction motor was connected to one of these exciter sets, and being normally driven above synchronous speed, we are enjoying the spectacle of the station light and power meter running backwards, the power being supplied to the transmission line from the exciter set.

Some of these savings and economies may seem almost trivial; it is however, no valid argument against them to state that a certain proposed economy will be so small that it will never be noticed among the hundreds of millions of kwh. generated annually by a system of generating plants. Very possibly we will not be able to actually demonstrate the amount of a saving by means of meter readings, but if we know that the economy has been effected, we are justified.

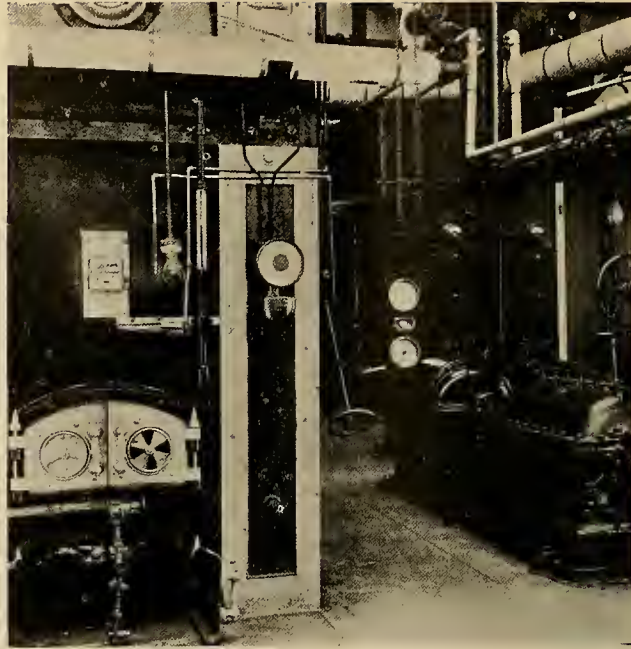
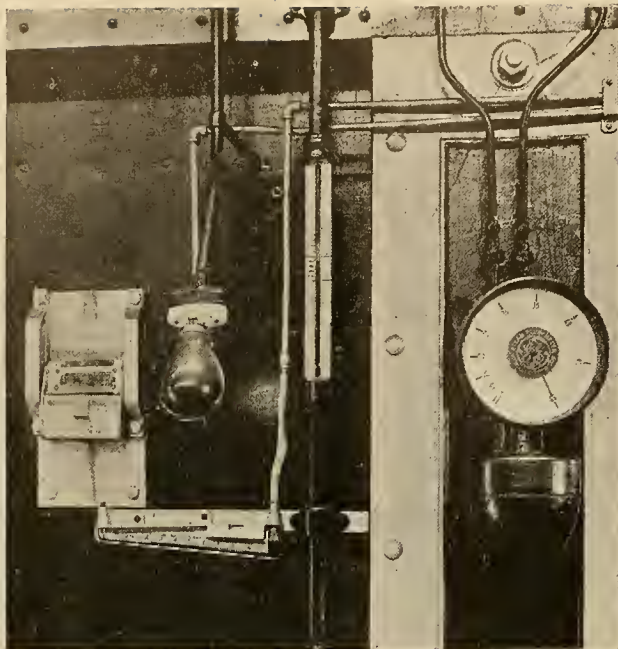
After our best efforts have been expended there will necessarily be unavoidable losses; 100 per cent is the objective; our success is not in attaining, but in how closely we approach it. The distribution of the losses in typical hydro-electric plants is given in Table 1 for three stations of different sizes, and it appears that with the best of care and fairly modern apparatus about 75 per cent of the total energy of the water can be delivered to step up transformers for transmission.

TABLE 1						
Losses in Hydraulic Plants						
Kw. Capacity at Plant:	32,000	%	20,000	%	3250	%
Water energy at diversion.	42,800	100	27,200	100	4820	100
Energy at wheel nozzle...	40,870	95.6	25,030	92.0	4350	90.2
Energy at generator shaft.	33,330	77.9	20,900	76.8	3455	71.6
Delivered to bus bars.....	32,000	74.8	20,000	73.5	3250	67.4
Delivered to step up transformers	31,937	74.6	19,920	73.2	3235	67.1

You call them "our boys"—are they yours?

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ECONOMY MEASURING APPARATUS—II

Meters for individual units often prove helpful, as do particular sets of instruments for steam supply to the larger power units. In the view to the left is shown the steam flow meter, carbon dioxide (CO_2) indicator and draft gage installed on the front of each boiler unit. Note that the CO_2 meter registers 14 per cent and the draft .23 in. To the right is seen a steam flow meter, a draft gage and indicating carbon dioxide (CO_2) meter on the boiler front and the Venturi meter for measuring the total feed water of eight boilers on a 20,000 kw. steam turbine at the Long Beach Plant of the Southern California Edison Company.

The energy leaks in a steam plant are many and various, and are as follows:

1. Loss to stack.
2. Low heat absorption by the boiler from soot on tubes or scale within them.
3. Blow down losses.
4. Steam to burners.
5. Radiation.
6. Blow off loss from safety valves.
7. Turbine losses.
8. Rejected to circulating water.
9. Net auxiliary power.
10. Generator losses.
11. Station light and power other than item 9.
12. Standby losses.

The losses due to imperfect combustion are apt to overshadow all others in the average plant, and in order to keep them down to a minimum at the Long Beach Steam Plant, we have an efficiency engineer whose main duty is to watch the boiler room operation. Each boiler is equipped with a CO_2 machine which records upon a chart, and also has an indicator mounted upon the boiler front, close beside it is a draft gage showing the draft on the boiler side of the boiler stack damper, and a steam flow meter. The fireman is instructed as to the draft that should be maintained according to the steam flow, and he operates primarily in this way, the CO_2 indicator being used as a check. The recording CO_2 machines are further checked up frequently with a portable Orsat machine. It is found to be entirely practical to keep the CO_2 at about 14 per cent, indicating but 20 per cent of excess air, corresponding to 2 per cent of the energy of the fuel.

The temperature of the gases leaving the boilers varies from 500 degrees F. to 600 degrees F., depending upon the total evaporation. The true average temperature of stack gases is exceedingly difficult to measure. In an attempt to get reliable results we have used a resistance thermometer distributed over the whole gas passage, but even then inaccuracies are present, due to variable gas velocities over the cross section of the flue. At the best, with 14 per cent CO_2 , and 550 degrees F. gas to stack, there is a loss of 17.4 per cent of the fuel energy that goes up the stack. Realizing this, the boilers feeding the largest of the three turbines in the plant are equipped with economizers. The gases leave these at a temperature of from 200 degrees F. to 250 degrees F., the efficiency is increased by about 7 per cent at rated load and by 10 per cent at 160 per cent of rating, the unavoidable loss with 14 per cent CO_2 and 250 degrees temperature being 10.2 per cent.

Soot on tubes or scale within will increase the temperature of waste gases; we find that after two and one-half months operation, the temperature of the waste gases in a certain boiler had risen to 670 degrees F. Careful hand cleaning reduced them to 595 degrees F., denoting an increase in efficiency of 1.9 per cent.

We are now experimenting with a soot blower installation permanently made a part of the boiler equipment, but it has not been in service long enough at the time of writing to enable the results to be judged.

Tube scale is a matter of water quality and treatment. We only find it necessary to clean boilers once every three months, and the scale is very light. It would be interesting to know if the permutit system of water treatment had given satisfaction on a large scale, and to get some accurate data upon the amount of blowing down required compared to what is necessary with other systems of water treatment.

The loss from blowing down boilers may be con-



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siderable. In ordinary practice, we blow off about 18,000 pounds of water in twenty-four hours from each boiler in constant service. This loss of heat amounts to 0.6 per cent of the heat in the steam output of the boiler during the same time and in actual quantity represents $1\frac{1}{4}$ barrels of fuel oil per boiler per day. If due to leaky turbine condensers salt water gets into the boilers this blow down loss may be increased sev-

market. It requires a good deal of study, by one prophetically inclined, to equate the value of the oil that will be saved in the next five or ten years with all the expense of heat insulation. In the meantime, it might be advisable to paint the boilers white.

The loss from safety valves blowing can be minimized by having an indicator in the boiler room to show how many valves are open on the turbine or to



ECONOMY MEASURING APPARATUS—III

The temperature and pressure of the steam and water from the boiler down through the condenser need careful attention in the economic operation of the modern power plant. On the left is exhibited the vacuum gage, barometer and thermometer installed between the first and second pass of the steam turbine. Note the vacuum of 29.15 in. with the atmospheric barometer reading of 30.1 ins. To the right may be seen recording meters for inlet and outlet temperatures of the circulating water, steam temperature, vacuum and steam pressure, and the temperature of the condensate. The Klaxon horn at the right of the meter board sounds an alarm when the oil pressure accumulator drops. This installation is at the Long Beach Plant of the Southern California Edison Company.



eral hundred per cent, and with twenty boilers in operation, may amount to some 100 barrels of oil per day. To watch this matter intelligently, water is sampled from each boiler, and the amount of salt determined chemically; it having been determined by exhaustive tests that a concentration of over 200 grains to the gallon causes priming. Constant daily tests are also made of the condensate water and condensers are overhauled whenever the salt exceeds one grain per gallon.

Steam used for atomizing the fuel is a double waste; first, on account of its loss; secondly, because the make up water that replaces it brings scale forming impurities into the boilers. Our experiments indicate that there is no magic in any particular burner, and the wonderful savings effected after installing somebody's patent burner are chiefly due to greater care in damper regulation.

In order to save atomizing steam, burners should be crowded to the limit as, at all events, with one type of burner we use, the quantity of steam necessary for good atomization is almost independent of the quantity of oil being burned. In a boiler equipped with four burners nearly half the atomizing steam can be saved on half load by cutting out two burners and loading up the rest. This burner steam is by no means negligible, amounting to 5500 pounds per hour for a 20,000 kw. load requiring 23,000 pounds of fuel oil per hour.

Radiation losses from boilers can be reduced by the various heat insulating materials that are upon the

show the kw. load upon it, whichever is the more feasible.

Safety valves should also be kept in adjustment so that the difference between their blowing and closing pressures will not be excessive. The losses in turbines are inherent to their design, reference now being made to blade losses; it is extremely valuable to have the means of checking the steam rate from time to time as fouling of blades, erosion, or damage from foreign bodies passing through will be detected. The blading of all turbines should be inspected once a year if possible, assuming the turbine to have been in daily service. Accumulations of scale in the blading may sometimes be removed by pumping coal oil in while a minimum amount of steam is keeping the machine up to speed. At times such methods fail and the turbine must have its blading cleaned by hand. The real remedy is to treat the boiler water so that it will not foam over and, as previously noted, to keep the condenser tight. If an accumulation of scale or dried mud is found upon the steam screen near the throttle, no time should be lost in checking the trouble, or blading will be eroded, and it is extremely uncertain these days as to when new blades will be obtained.

People who have less than you
are giving.

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The greater part of the energy of our fuel oil is thrown away into the condensing water; roughly, about 60 per cent is thus wasted. The only help is to be found in cold circulating water and plenty of it; an apparent paradox where the colder the water and the more there is of it applied, the less heat it absorbs. That vacuum is the source of economy should be drilled into every engineer. Assuming no actual damage occurs to a turbine, about all the engineer can do to enhance its economy is to keep the condenser tight and clean on the water side, and to go after every possible leak on the steam side and to keep the vacuum and circulating pumps in first-class condition. In some tests made on a 20,000 kw. turbine carrying 17,300 kw., a leak one-twentieth of a square inch in area reduced the vacuum 0.2 inch.

The various auxiliaries in a plant may be either steam or electric driven, or both. In the latter case the greater plant economy will result from running sufficient steam auxiliaries up to the capacity of the feed water to absorb the waste steam, hot feed having the advantage over cold in not checking the boiler evaporation so greatly when emergency calls are made.

Generator losses are fixed by design except that when operating two or more machines in parallel, fields should be adjusted to give the same power factor to each, thus eliminating cross currents.

Lights and the operation of various pumps for circulating transformer oil and water, drainage, fuel oil, and other occasional uses, comprise an item generally known as station light and power. According to the system in use, this may also include electrically driven turbine and boiler room auxiliaries.

The final economy of the Long Beach Steam Plant for the year 1917 was 238 kwh. per barrel. This is after deduction of station power. The total energy generated was 133,528,000 kwh., giving a local load factor of 32.47 on a plant capacity of 47,000 kw.

In all auxiliary plants which may be called upon instantly to pick up load dropped by some portion of the system in momentary distress, further losses occur in keeping boilers hot beyond the normal operating capacity. This is insurance, and if desired, must be paid for.

Of greater national importance than the elimination of all waste possible in individual plants, is the larger problem of operating all generating plants that can be interconnected for the greatest combined efficiency. The principles are simple, the application sometimes extremely difficult.

1. All hydro-electric plants upon streams without storage must be kept fully loaded to the extent of the available water, and if the market will not absorb all the power at certain times of day or seasons of the year, interconnection with other systems must be sought and the surplus power utilized.

2. Hydro-electric plants with storage must have the water used at such a rate that their peak load value will be available when most needed, and in this way keep down the investment in steam auxiliary plants.

3. Hydro-electric plants with storage must so adjust

their daily load curve as to enable the auxiliary steam plant to produce its quota of kwh. with the fewest number of turbines in the least number of hours.

4. The more efficient steam plants must be operated to the exclusion of the less economical, transmission losses being considered. The criterion being that the aggregate oil burned in all plants shall be a minimum.

As stated, difficulties beset the operator attempting to conform to the ideal. He is hampered by lack of interchange capacity in lines, frequency changers and transformers, expediency as regards shutting down the small steam plants and reducing insurance against interruptions, and other details of operation beyond the scope of this paper.

As an indication of what has been done, and is in process of completion, may be mentioned:

1. The increase of the storage of Big Creek plants, and their operation so as to utilize all the water of constant flow plants and maintain as nearly as possible block loads upon Long Beach Steam Plant, and the minimizing of the number of turbine hours of operation.

2. Interconnections with the Southern Sierras Power Company through a 5000 kw. frequency changer by which their surplus hydro-electric power is utilized.

3. The burning of all available natural gas at Redondo Steam Plant to save oil.

4. Interconnection with Mt. Whitney and San Joaquin Companies, eliminating oil other than for standby, by operating generators at Kern River No. 1 at 60 cycles upon their systems.

5. Transmission line to Santa Barbara nearly completed which will transfer approximately 7,000,000 kwh. annually from a small, relatively inefficient plant to Long Beach Steam Plant.

6. Interconnection under way with San Diego Consolidated Gas & Electric Company through two 5000 kw. frequency changers at Capistrano, which will transfer steam load to Long Beach Steam Plant.

The time will come when the generating plants of California will all be interconnected and with full development of our bountiful water powers, the necessity for steam will diminish, not perhaps to the vanishing point, but to a proportion that will not be a burden upon our oil production on one hand, nor upon the other will the fluctuating cost of oil materially affect the cost of power.

A HINT TO THE TRADE IN CUBA

American manufacturers are frequently called upon to make sales of their products to individuals or companies that are not prepared to pay the full purchase price, and in such cases it is a matter of great importance to retain control of the article until all of the terms of the contract have been satisfied. Particularly is this true of machinery and other articles of relatively high value, for which the full purchase price is ordinarily not immediately available. The practice common in the United States, whereby goods are sold on the installment plan with reservation of the title until the full price has been paid is, however, not applicable in Cuba, where the word "sale" is understood to mean a complete transfer of ownership.

The plan which has been followed successfully by some of the largest American companies is to lease, or rent, the goods with an understanding that the rent paid shall apply on an agreed purchase price. When this has been paid in full the title passes to the purchaser.



The average American has a better opportunity in life than the average German. Why?

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TRANSMISSION AND DISTRIBUTION LOSSES

BY R. E. CUNNINGHAM

(Electric service is one of the necessities of war. Along with munitions and aeroplanes, its production must be stimulated rather than cut down. The only saving possible in the present situation, therefore, is in the elimination of losses, and it is this topic which has been taken up for primary consideration by the Engineering Committee for the coming war service convention of the Pacific Coast Section of the N. E. L. A. This paper, by the superintendent of electrical distribution of the Southern California Edison Company, covering losses on transmission lines as met by that company, is one which merits careful consideration.—The Editor.)

A study has been made of the transmission and distribution systems of the Southern California Edison Company in the attempt to determine where the various losses occur, and to devise ways for reducing these losses. On account of present conditions it is necessary to conserve for useful purpose, as far as possible, all current generated, and any changes in the system which are proposed for reducing the losses must be made at a minimum expenditure on account of the stringent financial conditions. The investigation reported herewith covers the period from January 1st to June 1st, 1917, and does not represent the conditions since the consolidation with the Pacific Light & Power Corporation, but data shown is sufficient for the purpose of discussion.

During this period there were installed on the transmission system step-up and step-down transformers totaling 288, with capacity aggregating 265,375 kilowatts; on the distribution system there were installed 2376 10,000 and 15,000 volt transformers, total capacity 39,265 kilowatts, and 8032 2200 volt transformers, total capacity 67,293 kilowatts. Total number of meters 129,678. An average peak of 65,000 kilowatts with a load factor of 58.

The power generated at the various plants on the low tension bus bars is stepped up for transmission to various main substations, where it is stepped down to proper distribution voltages and metered before being delivered to the distribution system. Our consumers' services are again metered, as well as power delivered to street light circuits, or used for station light and power purposes in the generating plants and substations. With such an arrangement it is possible to sub-divide the various losses between the generators and the consumers' meters into the following classifications: Power house losses, transmission line losses, transformer losses, substation losses, distribution line and other losses, and consumers' meter potential losses. There is submitted herewith a chart of one dimension, which will serve to show the losses in the various classifications mentioned in proportion to the amount of power sold through consumers' meters.

All power used at generating stations and substations for the operation of auxiliaries, lighting, etc., is separately metered at each station. It has recently been found that considerable economy can be effected by careful attention to the use of power in the stations; lights being needlessly used during the day and often more at night than necessary; also electric heaters and similar appliances allowed to operate when not required. Strict orders have been issued to economize on use of station light and power as far as possible.

The losses on transmission lines and transformers have been determined by subtracting the output of

substations from the amount generated at the various power houses; the proportion of line loss has then been determined by calculating the transformer losses. It will be seen that the transformer losses are a large portion of the total transmission losses, being 9.87 per cent as against 4.88 per cent line losses. Transformer losses appear excessive; this can be explained in a large degree by the fact that step-up transformers are necessary at the power houses as well as step-down transformers at the substations, and under certain conditions current must be stepped down a second or third time before the proper voltage is obtained for distribution. Copper losses in the transformers are in proportion to load, while core losses are constant and continual. One suggestion which can be given for reducing transmission losses, therefore, is to disconnect spare banks of transformers when they are not actually required to carry load.

The transmission line losses are fixed by the size of conductors, and without spending additional money for increased size of copper, which is prohibitive at this time, there is no way of reducing line losses except by judicious dispatching of load and the operation of synchronous condensers or motors, where available, to reduce to a minimum the idle current which might otherwise be transmitted over a long transmission line.

Distribution losses have been determined by subtracting total consumers' meters from the output of the substations. Knowing the total number and size of distribution transformers, their losses have been calculated and subtracted from total losses to determine the distribution line loss combined with the unknown losses, such as stolen power and slow meters. As in the case of the transmission losses, it will be noted that the distribution transformer losses form a large portion of the total distribution loss. Line losses may, in the case of our company, appear to be extremely small, but we attribute this to the fact that a number of large blocks of power are sold directly from substation buses or distributed over comparatively short lines.

Much could be said in regard to the most economical size and arrangement of conductors on the distribution system, but as this would result in the purchase of additional copper at a high market, the question must be passed at this time.

Unknown losses consisting of slow meters and stolen power we believe to be a very small percentage

The world thinks us merely commercial—

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of the total losses. Routine meter tests, and tests requested by the business office when meters show "no consumption" has resulted in keeping our meters in very fair condition. Cases of stolen power have become rare occurrences, especially since the passage of laws by which the companies can properly prosecute parties who have been discovered stealing current. We may therefore look to the matter of distribution transformer losses for effecting economy in distribution.

All transformer installations supplying strictly power service should be provided with switches on the primary side so that they can be disconnected from the line when not in use. Our standard form of contract specifies "that the consumer will disconnect the transformers when plant is not in operation." We have met with success in carrying out this arrangement to a large extent, we believe, on account of the fact that we make it easy for the consumer to disconnect his transformers by installing the switch in convenient location where it can be operated from the ground.

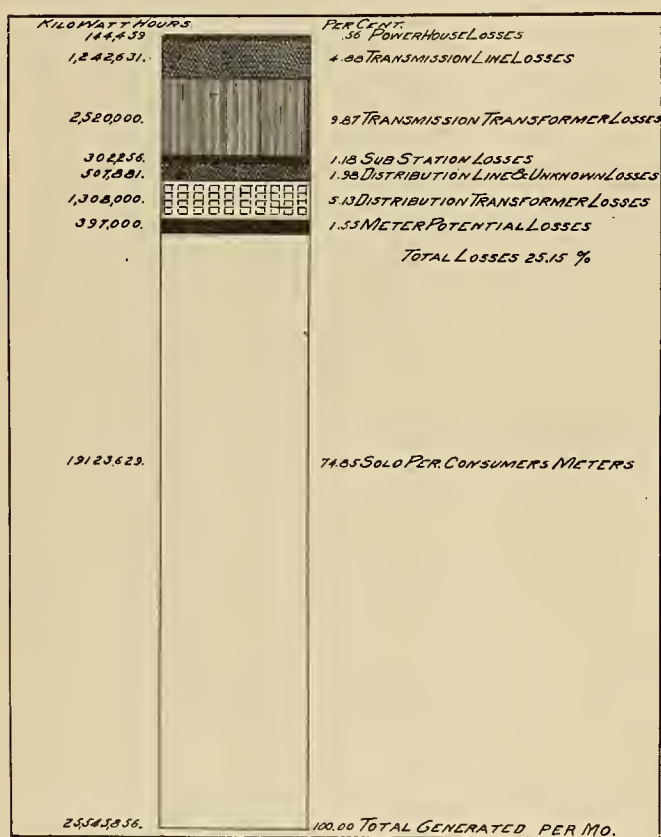


Chart showing types of losses on transmission lines

Transformers on our 10,000 and 15,000 volt systems are protected by pole top switches and in most cases supply strictly power load. Installations on the 2200 volt lines often carry a mixed load and it is impossible to arrange for disconnecting them when not in service; however, when 2200 volt transformers carry strictly power load they are also equipped with pole

top switches for disconnection. During the period of our investigation there was a saving in energy, by keeping transformers disconnected when not in use, averaging 360,000 kwh. per month, and as we were operating part of our load by steam during this period, this was equivalent to a saving of 1840 barrels of oil per month.

The Industrial Accident Commission has accepted the pole top switch, if placed convenient to the plant, as equivalent to an entrance switch just inside the building. This fact, together with a saving in core loss justifies the additional cost of the pole top switch.

"Keep transformers well loaded" is a good rule to follow. Underloaded transformers mean additional core loss. If you are having only very infrequent burn outs it is a pretty good sign that the transformers are not working to their capacity.

When distribution lines are extended into new territory, in most cases it is impossible to forecast the final distribution of load, and the usual practice is to install small transformers at more or less frequent intervals, as the load develops; later, as opportunity permits, it will be found that a large saving in transformer losses can be brought about by placing larger transformers systematically located, so as to reduce the total kilowatt capacity and total number of transformers installed. This operation is popularly known as a "clean up."

We have found it advisable to test all transformers when received from the manufacturers, so as to be informed as to their characteristics and losses. This practice not only applies to transformers owned by the Company, but it is understood that when transformers are purchased by customers to be connected to our lines they must pass through our test department and be accepted by the company.

Meter potential losses form only a small per cent of the total losses, and the only way to make a reduction is to gradually replace the old types of meters which have high potential losses. The new type 5 amp. induction meter has a potential loss in the neighborhood of one watt, as against five watts for the old T.R.W. meter. As the T.R.W. meter runs slow a short time after being calibrated it can be easily shown that on alternating current circuits the expense of replacing them with induction type meters is soon paid for by the reduced cost of routine tests and the saving in lost power.

BUSINESS CONDITIONS IN RUSSIA TODAY

"The Russian farmer is back at work on the land and living on his own produce," reports Charles L. Preston, a prominent New England shoe and leather man, who has just returned from a trip to Vladivostok on a special mission for the Bureau of Foreign and Domestic Commerce, Department of Commerce. "So far as food is concerned he is not badly off, but he is putting very little on the market. He barter for the little he needs in the way of manufactured goods."

The business stagnation in Russia, explains Mr. Preston, is due in part to the depreciation of the ruble and to restrictions on the banks. Transfer of money by banks from one city to another is forbidden, and depositors are not allowed to draw more than 250 rubles at a time.



If you have the necessities of life
you can afford one.

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BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

RETAIL SELLING PRACTICE

(A remarkable analysis of the problems which confront the electrical dealer has been worked out by a sub-committee consisting of H. F. Allen, E. B. Criddle, H. A. Lemmon, M. L. Scobey, with L. H. Newbert as chairman, under the Commercial Committee of the Pacific Coast Section, N. E. L. A., for the coming convention, and is here presented. There are definite suggestions for future action on the part of the individual and the group, as well as much good advice given by those who have studied the problem at first hand and who know how to meet difficulties, because they have met them and succeeded at the game. The questions of store location and business methods are taken up in this issue—selling practices and advertising will appear later.—The Editor.)

Preliminary Statement

The merchandising efficiency of the electric dealer is a problem that intimately affects the welfare not only of the dealers themselves, but the manufacturer, the jobber, and the central station. Though, therefore, this paper is primarily intended to assist the dealer in adopting selling methods in line with the best modern practice of successful retailers in other branches of business, it must be understood throughout that the wholehearted support and co-operation of manufacturer, jobber and central station are imperative if the present division of labor amongst the four branches of the electrical industry above named is to be the success which it undoubtedly can be.

Unfortunately, conditions have arisen in the past, in many towns and cities, which have opened a breach between dealer and central station until both parties seriously doubt the good faith of the other when co-operation is mentioned, with the inevitable result that new business has suffered thereby.

An analysis of many such cases shows that the fault lies almost invariably:

(1) In a lack of understanding of the principles of merchandising on the part of the local agent of the central station and hence an inability to view the problems which may arise from the dealers' point of view.

(2) Poor business methods on the part of the dealers.

(3) Lack of co-operation amongst the dealers themselves

(4) Lack of co-operation between the dealers as a unit and the central station.

This paper will endeavor by a brief review of modern merchandising methods as adopted by successful retailers to assist the dealer and central station in correcting the first two faults enumerated above, but true success is also entirely dependent upon the co-operation between dealers as a unit and the central station.

Your committee would earnestly recommend that in every town and city there be founded a local association of electrical dealers and contractors and that this local association meet together with a representative of the central station at least once a week to discuss in a friendly spirit plans for the increased sale of electrical energy and appliances amongst the community served.

For consideration in this paper the problems which face the electrical retailer will be classified into divisions as follows:

(1) **THE STORE.** Its location, rent, arrangement, and management.

(2) **THE COST OF DOING BUSINESS.** The purchase of stock, the necessity of quick turn-over of stock, accurate cost keeping, price filing.

(3) **SELLING METHODS.** Getting the customer in; special campaigns, window displays, the salesman.

(4) **ADVERTISING.**

THE STORE—

Store Location—It may be fairly presumed that the reader of this paper will be already located in some town or city, and that the point which will interest him most is if his present location is best adapted to his business, but there may be some who desire to start in business or who feel that there are greater prospects in some other community.

In selecting a town there are several things to be considered. First: Market. Is there already a demand or can a demand be created for the articles to be sold? Second: Competition. To what extent is the field occupied? A large city by weight of its natural growth may often absorb and support a new plant or store or distributing center, whereas, in a small town the advent of a new competitor may spell disaster alike to the established houses and the newcomer.

In selecting a town in which to locate, therefore, the following items should be fully investigated:

(a) Population, with growth for past five years and reasons for assuming that it may or may not increase year by year.

(b) Possible total number of customers.

(c) Number of existing dealers in electrical supplies and merchandise.

(d) How do these dealers treat their customers, and what is the public feeling regarding them and their method, and prices?

(e) Are they aggressive in going after business or do they wait for it to come in?

(f) Since electrical dealers are often contractors also, what is the character of the work being done by them, and are their charges reasonable?

(g) What proportion of the residences and business houses are already wired and using electrical energy, and to

When the house is on fire is no
time to hoard the water.

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A STREET SCENE WITH AN OBJECT LESSON

Not an electrical dealer's—but with a lesson which may be electrically applied. To the purchaser of household electric appliances the appearance of greasy wire with working tools thrown helter-skelter around in the electrical contractor-dealer's store, is strange and novel in some respects, but in the last analysis it is as repulsive to the customer—usually a woman—as this barber shop on the streets of Canton, China, is to the American citizen desiring a clean, wholesome shave.



what extent are they already adequately served, the people receiving good work at reasonable prices?

If the present dealers are moderately busy, if the town is not growing or customers are already well supplied with appliances, the location is obviously a poor one in which to start a new business, though it might be possible to buy out one of the existing houses and build up a good business.

If, on the other hand, the town is growing rapidly, an investigation may show that there is room for a new man who knows his business and is alive, aggressive and dependable.

The selection of the location of a store in any town or city is a problem which rarely receives the consideration it deserves, but it is one which may vitally affect the success or failure of an enterprise, and that this is appreciated by large manufacturers and wholesalers is shown by the stress laid by the credit managers of these companies upon desirability of location for the particular business concerned when considering applications for credit.

Among the determining factors in selecting a location are the following:

(a) Accessibility—Selection of Neighborhood

In selecting a store for the sale of electrical appliances the considerations involved differ greatly from those which would affect the location of a grocery, a cigar store, or a cafeteria. For the articles sold in these stores there is a continuous demand, and whereas the grocery might be most successful in the heart of a residential district—the cafeteria in the heart of the office district, and the cigar store on the main business thoroughfare, it is possible and even probable that an electric store might not be successful in any of these districts.

In general, the demand for electrical appliances must be created:

First: by attractive window display. Second: by advertising. Third: by solicitation. It is essential, therefore, that the store shall be in such a location that the right people shall see the window display and that it shall be easily accessible to the prospective customers influenced by the advertising or by the solicitor. There is also the undoubted advantage of being near

the office of the power company, due in the first place to the fact that a large number of customers will first seek advice from the company regarding appliances, and will then naturally seek the nearest store to follow out the advice given by the company's representative, and in the second place to the natural connection which forms in a person's mind between the payment of the electrical bill and lamps or any other appliances which may be needed.

Fortunately, as a rule, the offices of the central station are located in the down-town shopping district, which is as a rule the ideal location for the electrical dealer's store.

A little consideration will show why the shopping district should be preferable to the others for, though in the wholesale or office district hundreds more people may pass the store in a day, their minds are intent on other matters and very few will notice the window display, however attractive it may be, or even be aware of the store's existence. On the other hand, it will be found that the sales of the great majority of electrical appliances are influenced by women, the great majority of whom carefully watch the windows in the shopping district, which is also always easily accessible from all parts of the town or city.

Supposing that the shopping district (if possible, in the neighborhood of the power company's office), has been decided on, there may still be a choice as to position in the block, side of the street, or immediate environment.

The corner of a block is always considered the most desirable location, but as the rent of a store in this position is usually at least 50 per cent greater than a store of the same floor area in the center of a block, it is doubtful, when taking into consideration the peculiar conditions affecting an electric appliance store, if this additional overhead expense is normally justified.

It will be found in every street that pedestrian traffic is attracted to one side of the street rather than the other. This may be due to the sun, the wind, or to some store which is a particular attraction. No rules can be given governing this, and only careful observation can determine which is the better side. For instance, in mild climates, the sunny side is, as a rule, the more popular, provided it is not exposed to very strong winds.

The question of immediate environment is also one of importance. The store should not be set back from those adjoining it and the character of the busi-



After all, you are only saving money.

BUY A LIBERTY BOND

nesses carried on in the adjoining premises should be more likely to attract attention to the electrical store than to detract from it. For instance, a furniture store with well displayed windows, would be an ideal neighbor, whilst as an extreme example in the other direction, no woman would be predisposed towards a store located between two saloons.

Store Rent

It is obvious that the amount which may be expended on rent must also depend largely upon individual conditions and that it is impossible to give any general rules governing this. The amount expended for rent by successful retailers in other lines would appear to vary from $2\frac{1}{2}$ to 10 per cent of the gross sales and a fair average would be from 4 to 6 per cent.

It is, however, certain that the efficient dealer who is willing to pay a fair rent for an attractive store in a good accessible retail district, will be far better off ultimately than one who endeavors to conduct his business from a workshop in a side street; on the other hand he will also be more successful than the man whose profits are largely absorbed in maintaining an elaborate high rental establishment which can never be efficiently used to bring the total sales up to the point at which the rent would be a reasonable proportion.

A store which will just attractively display all the goods for which there is a reasonably quick turn-over is all that is required.

There can be no set rule for the arrangement of the store that will fit all cases, but there are a few ideas and suggestions that will be of use to all whether they be large or small dealers.

Always bear in mind that you are dependent largely upon sales to women and that they are lovers of cleanliness, and in order to attract and keep their trade your store, stock and fixtures must be kept in order, cleaned, polished and dusted.

The store floor and sidewalk in front of the store should be thoroughly swept daily and the windows should be washed as often as necessary to insure cleanliness, the show cases cleaned and goods on display in them kept in order, always seeing that samples are replenished from stock.

Make your store attractive, so that people will want to come in, keep it cool in summer and warm in winter and have it always well lighted. Provide seating accommodation for lady customers who would perhaps become tired and nervous if compelled to stand. A table with current literature would be desirable.

It is absolutely essential that nicked goods, such as toasters, percolators, chafing dishes, grills, etc., be dusted every day and that they be cleaned and polished at least once a week, regardless of whether they are kept in show case, wall case, or on a display table or shelving.

A few dollars expended for standard repair parts, tools and equipment to take care of this part of the business is just as necessary to success as it is to carry flatirons and sockets.

When a customer brings in a cord to be repaired, don't belittle the business by taking out pliers and screwdriver and making the repair in his presence.

Whatever it is, take the article and, after getting his name and address, give him a repair check, telling

him how much the cost will be and when it will be ready.

If you say it will be ready at 5 o'clock, see that it is ready at 4:45, for by making a promise and keeping it, you gain the customer's confidence, whereas if you fail to have it ready when promised, the customer is almost always annoyed by the uncalled-for delay, and if repeated, he is apt to go elsewhere the next time he needs something electrical.

The repair department should be away from the store proper, preferably in the basement or at the back of the store with a partition shutting it off from public view, as a repair bench at best is unsightly and far from being attractive.

If your means will permit, give your goods the consideration that is due them. For instance, it would be well to have percolators, chafing dishes, tea-samovars, water heaters and toasters displayed in wall cases with glass doors, so as to be not only kept away from dust, but to be in full view of the customer at the same time.

Show cases should contain heating pads, curling irons, vibrators, hair dryers, immersion heaters, shaving mugs, flashlights or any other small devices of a similar nature.

Electric heaters and fan motors can be displayed nicely on low, felt covered benches, or on separate stands or pedestals, and if a dealer carries art metal library and boudoir lamps they can be displayed either on a wall rack, preferably with shelves of graduated width, or on separate stands or pedestals.

One of the most important articles on sale in practically all cases is the flatiron, and some thought and care should be used in its superfluous verbiage display.

As it is the appliance most called for, it is the writer's opinion that samples of every make and size carried in stock should be displayed on an open table, either felt or velvet covered, and the height of the table or counter should be taken into consideration.

If it is too high, the woman looking for an iron has to exert herself when lifting it up for inspection and may be discouraged from buying it for that reason, and if too low, she will be obliged to stoop over and that is an evil almost as bad as the other.

A profitable factor in the electrical dealer's business is the sale of Mazda lamps, and it is such a generally known and used article that some dealers pay no heed to its sale and display, taking the business as a matter of course, one that needs no sales talk or attention; but it should be given consideration from several viewpoints.

It has been suggested to the writer by a prominent dealer—and his point is well taken—that the lamp counter and stock should be well beyond the center of the store, for the reason that 40 per cent of the customers come into the store for the sole purpose of purchasing one or more Mazda lamps, and naturally go to

No ruler forced us into war—we
choose our leaders.

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No woman could go by this window without looking in—and thus the first step in the creation of a demand for electrical appliances has been taken.



that part of the store where they are kept and displayed.

By having them at the back of the store, the customer (in the majority of cases a woman) passes your show cases, display tables, etc., and in many instances her attention is attracted in passing to some new device she has heard of. She will perhaps inquire about it, thus giving a chance for demonstration, often times resulting in an immediate sale, or perhaps a promise to purchase at an early date.

One of the best methods of showing various sizes and styles of lamps is to have a piece of O. B. tubing (preferably square), 3, 4 or 5 feet long, according to available space, with 9 or 10 pull chain sockets connected up, which enables the displaying of standard lamps from 10 watt size up to 100 watt type C, as follows:

- 1— 10 watt clear Mazda.
- 1— 15 watt clear Mazda.
- 1— 25 watt clear Mazda.
- 1— 40 watt clear Mazda.
- 1— 50 watt clear Mazda.
- 1— 60 watt clear Mazda.
- 1— 60 watt frosted Mazda.
- 1— 75 watt clear Mazda C.
- 1— 75 watt frosted Mazda C.
- 1—100 watt clear Mazda C.
- 1—100 watt frosted Mazda C.

In quite a number of cases the customer is undecided as to just what sized lamp she wants, and with display rack as outlined, she can readily decide which one is best suited to her needs.

In connection with lamp sales, I wish to point out a suggestion made by another prominent dealer, and that is that he finds it advisable to have the standard sizes of lamps wrapped, ready for delivery, in packages of one, two, three or six, as the customer may require, thereby facilitating the sale and often selling six lamps to a customer who would perhaps otherwise buy only five.

On the other, another dealer points out that he prefers to test and wrap the lamps in the customer's presence, thereby showing that the lamps are in good shape and at the same time giving her an opportunity

of looking around the store while the package is being wrapped.

The package containing articles purchased should be neatly wrapped up and handed to the customer, not merely pushed across the counter. Change should be counted out either into the customer's hand or onto a rubber mat from which it can readily be picked up.

In this connection, let me mention that in tying up a package, no harm can be done and much good may come from your putting in a little booklet, blotter or flier describing some new or useful article.

Any manufacturer will be glad to supply you with an ample quantity of advertising matter such as this, with your imprint thereon, and if consistently used, it will be the means of your making additional sales.

The display of miscellaneous material such as batteries, sockets, plugs, switches, fuses, extension cords, etc., is one that must be given careful consideration.

If displayed in cartons on shelves or in trays on a counter, they must be kept in order.

It is the writer's opinion that these articles should be kept at all times readily accessible, but out of sight as much as possible.

Another dealer points out that he is getting good sales results in having similar articles openly displayed on tables, each in a cardboard tray especially made for that purpose, about 8 inches by 12 inches, and 2 inches deep, covered inside and out with an imitation oak paper.

As stated before, the contractor-dealer must gain the confidence of his customers in order to succeed and one way to help get this much-needed confidence of the public is to have each and every article tagged and priced in plain figures, so that if an article is priced at \$7.50, the customer has reasonable assurance that that is the price and John Jones is not going to get the same thing for \$6.75. I mention this because I have personally gone into shops where goods have been priced in code, and while I may have purchased that for which I went in, it did not tend to strengthen my confidence in the place, because I had a sneaking idea that while they told me the price was \$11.25, they might turn around and sell the same thing to Bill Smith for \$9.00.

Don't sell or stock any article that you haven't the utmost confidence in or any article the merits of which are doubtful, and on which there is apt to be a



Are you passing yourself off as patriotic?

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comeback, for it only means a black eye to your business.

Satisfy yourself that any and all articles you sell are what they should be, and that the manufacturer of them is a reputable concern and says that they are what they are represented to be, and then you or your clerks can stand up before any customer and tell him freely and frankly that the article you are selling him is made for that purpose, will do the work, and that not only the manufacturer but you personally stand behind it, and that if it does not do or is not as represented, it will be made right or money cheerfully refunded.

You may get away with cheap, shoddy goods once or twice, but you can't build up a business on that basis and the electric contractors and dealers must make an effort to put their business on the firmest footing possible.

The question of store lighting is also to be considered.

A year or two ago, I am fairly safe in saying that the electrical dealer's store was about as poorly lighted, if not worse, than any other business house in his town.

One of the principal revenues of the contractor-dealer is in recommending and installing up-to-date and better lighting systems for other merchants, while he himself has practically no lighting at all, and if this brother-merchant is a thinker—and we believe he is—the chances are that these recommendations will be taken with quite a few grains of salt, because, why should he improve his lighting at the dealer's suggestion when his present system of illumination is far better than that which the dealer has in his place of business. However, I am glad to be able to say at the present writing, that the lighting of the contractor-dealers' stores is greatly improved and quite up to date and that almost any merchant would take their suggestions or recommendations for better lighting.

THE COST OF DOING BUSINESS—

The profit in any retail business is the difference between the selling price to the consumer and the cost of the goods plus the cost of selling, and it is essential in these days of fierce competition from without and within, that the electric dealer should know both these figures accurately, and not only know them, but carefully analyze them. If he believes that his costs are greater than they really are, he may believe himself in danger when he is actually doing well or, which is far more common, he may underestimate his costs and actually be within reach of a financial crisis.

Accurate knowledge of costs will not eliminate competition, but with exact knowledge it is certain that most dealers will hesitate before cutting prices down to below cost line.

These rules for figuring costs and profits are recommended by the National Association of Credit Men:

(1) Charge interest on the net amount of your total investment at the beginning of your business year, exclusive of real estate.

(2) Charge rental on all real estate or building owned by you and used in your business at a rate equal to that which you would receive if renting or leasing it to others.

(3) Charge in addition to what you pay for hired help an amount equal to what your services would be worth to

others; also treat in like manner the services of any member of your family employed in the business not on the regular pay roll.

(4) Charge depreciation on all goods carried over on which you may have to make a less price because of change in style, damage or any other cause.

(5) Charge depreciation on buildings, tools, fixtures, or anything else suffering from age or wear and tear.

(6) Charge amounts donated or subscriptions paid.

(7) Charge all fixed expenses, such as taxes, insurance, water, lights, fuel, etc.

(8) Charge all incidental expenses, such as drayage, postage, office supplies, livery or expenses of horses and wagons, telegrams and telephones, advertising, canvassing, etc.

(9) Charge losses of every character, including goods stolen or sent out and not charged, allowances made customers, bad debts, etc.

(10) Charge collection expense.

(11) Charge any other expense not enumerated above.

(12) When you have ascertained what the sum of all the foregoing items amounts to, prove it by your books, and you will have your total expense for the year; then divide this figure by the total of your sales, and it will show you the per cent which it has cost you to do business.

(13) Take this per cent and deduct it from the price of any article you have sold, then subtract from the remainder what it cost you (invoice price and freight), and the result will show your net profit or loss on the article.

(14) Go over the selling prices of the various articles you handle and see where you stand as to profits, then get busy in putting your selling figures on a profitable basis, and talk it over with your competitor as well.

The above rules will repay the most careful study, for every item enumerated means some charge which must be deducted from the gross sales before any actual profit can be figured.

Turning Over the Stock

Rules 1 and 4 above, bring out the importance of reducing to the lowest efficient limit the capital investment in stock. By efficient limit is meant purchasing only such articles as can be disposed of within a reasonable time from the date of purchase. Every item should be bought with the idea that a purchaser must be found for it within that length of time.

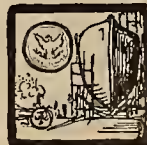
Over-buying is continuously depreciating the value of good merchandise, and only the old-fashioned retailer any longer takes any pride in the placing of huge orders. The modern buyer takes pride in the fact that he has created a desire for newer merchandise in his customers and has never stocked above the efficient limit.

In some of the most modern department stores, the efficient limit is placed at two months, whilst the majority of the merchandise is supposed to be turned over twice a month. The limit of two months may be rather low for some forms of electrical merchandise, though there seems to be no reason that this length of time should be very much exceeded, if both buying and selling are systematically done.

This question of turn-over is of the utmost importance and the modern dealer is not, as his predecessor was, content to know at the end of every twelve

A free man has greater responsibilities than a slave—

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THE STORE

Located in a live town.
 With not too heavy competition.
 In the shopping district.
 With good neighbors.
 Rent proportionate to sales.
 Repair department in rear.
 Attractive shop arrangement.

THE BUSINESS

Costs figured on sound basis.
 Stock kept moving.
 Capital investment kept down.
 Perpetual inventory.
 Monthly balance sheets.
 Overhead accounted for.
 Stock up to date.
 Profit figured on selling price.

months his turn-over on his stock as a whole for the previous year, but he insists on knowing at the end of every month what his turn-over has been on each particular line. This monthly report enables him to keep his fingers right on the pulse of his business the year round and makes it possible for him to eliminate items which show a loss, to bolster up those that are weak, and to forecast his buying needs with the greatest accuracy.

The Perpetual Inventory

Turn-over is found by dividing the approximate laid down cost of all goods sold by the cost of the average stock kept in hand over the period in question, and only some form of perpetual inventory enables these costs to be obtained with any degree of accuracy.

It is impossible to describe in detail any system of bookkeeping for retailers. It is, however, considered worth while to describe the perpetual inventory in its simplest form and which, except in the case of very large stores, can be kept up to date by the salesman or saleswoman in charge of the store in the interims between waiting on customers, and in addition to their other duties.

This system necessitates one card for each item of material carried in stock. This card shows at the top a description of the item, from whom purchased, and the manufacturer's number. The left hand shows the quantity purchased, the date and the laid down cost. The right hand side ruled for month and days, shows the number sold and also the price at which sold.

In making a sale the salesman must show on the sales slip a sufficiently clear description of the goods sold to enable the person who keeps the cost cards to identify them. From the duplicates of these slips the cards posted every day with the number of each particular item taken from stock and a balance of each card struck at the end of the month.

It is important that no goods whatever should be taken from stock unless a sales slip is turned in. If the goods are on approval or removed for any reason except for sale, it should be so stated and marked on the card accordingly.

An analysis of the balance taken from the cards will show him at once: (1) if he is making sufficient margin of gross profit on every line; (2) if he is overstocked; (3) if he is not buying sufficient quantities of

any one line; (4) if a line is slow moving and needs special sales energy put behind it.

Now let the dealer, having before him his stock report as taken from his perpetual inventory, draw up a form showing the various charges which comprise his overhead expense, including all those laid down in the rules issued by the National Association of Credit Men, and figure his overhead charges for the month.

He will now be in a position to prepare a balance sheet which will show very closely his financial condition at the end of the month and which will enable him to compare the results of that month with any previous month, and to tell not only if he is progressing or falling back, but also where and why he is progressing or falling back.

All this may sound rather complicated, but as a matter of fact the only real trouble involved is in the first stock taking and initial writing up of the cards.

The perpetual inventory does not take the place of the regular yearly or semi-yearly inventory, as some errors will be bound to creep in and the perpetual inventory cards should be corrected by the regular inventory.

It must be borne in mind that profits are made on turn-over and a large part of the cost of doing business can be blamed on idle capital tied up in slow moving stock. Many failures are attributable to this cause. Goods turned over twelve times give twelve times the gross profits of goods turned over once, and the capital is earning more than twelve times as much. No goods should be handled that cannot be turned over by progressive sales methods at least once in four months, and the aim should be to turn over the value of all stock not less than once in 60 days.

If at the expiration of a reasonable period certain lines have not been sold at the regular prices, first make a special effort to find the right purchaser for them; offer the salesman a bonus to sell them. If they cannot be sold this way put all this poor stock on a bargain table away from the good stock and sell it at a loss if you have to, but sell it. Get your capital, or all you can of it, out of this dead stock and get it to working again.

Directly you see from the inventory cards that any line is moving slowly, get it up in some prominent position in your store, put a specially attractive card on it, advertise it, try to find the customer it would most appeal to and galvanize fresh life into that line. It may become one of your best sellers.

Watch your overhead. Don't forget that articles sold at laid down cost plus any percentage less than your overhead is being sold at a loss. Certain staples such as lamps, are easily sold and involve little selling expense and at the same time bring customers into



You are responsible to the next generation.

BUY A LIBERTY BOND

your store to see the rest of your goods and may therefore be excepted from the above rule, but in general sell nothing that does not bring in your laid down cost, plus your overhead, plus a fair profit. To this should be added a small margin to cover depreciation of stock and losses on goods necessarily sold at lower prices unless this has already been figured in on the overhead.

Do not go to the other extreme and not buy sufficient stock. First lay out your capital in those lines for which you know you have a demand, then carefully invest the balance in goods for which you know you can create a demand. Watch the trade papers and manufacturers' samples for new appliances which would be likely to interest your customers, and make each salesman turn in a special report every time a customer asks for some electrical appliance which you have not got in stock, and if there appears likely to be sufficient demand for it, stock it.

Make a point of purchasing nationally advertised articles. The manufacturers are creating a demand for you and have a reputation to maintain. The selling expense of nationally advertised articles is generally less for these reasons and it pleases a customer to be immediately supplied with what they demand.

In concluding this section, it may be of interest to quote "eleven reasons why the percentage of profit should be figured on the selling price and not on the cost," as given in a pamphlet issued by the Burroughs Adding Machine Company:

(1) Because the remuneration of salesmen is figured on a certain percentage of the selling price.

(2) Because the percentage of expense in conducting a business is based on the selling price. If you talk per cent profit on cost and per cent expense on the selling price, where are you?

(3) Because the mercantile and other taxes are invariably based on a percentage of the gross sales.

(4) Because the sales totals are always given in books of record, cost totals are seldom if ever shown.

(5) Because a profit must be provided for two items of capital—one the capital invested in merchandise—the other the capital necessary for operating expenses and other expenses not properly chargeable to merchandise account. This is only possible by figuring profit on the selling price.

(6) Because it indicates correctly the amount of gross or net profit when amount of sales is stated. The percentage of profit on sales is indicative of character of results of year's business—percentage of profit on cost is not.

(7) Because allowances in percentages to customers are always from selling price.

(8) Because no profit is made until same is actually effected.

(9) Because nine stores in ten which do not figure on the selling price get mixed somewhere in their figures and do not know whether they are going backwards or forwards.

(10) Because the big stores figure on the selling price.

(11) Because if you go to the cash drawer you can say "10 per cent of that money is my profit," instead of having to say, "10 per cent of the cost of the goods which I sold for that money is my profit."

SURPRISE TESTS were used recently by the Southern Pacific Company to ascertain just how effective their safety system was in practice. These tests took the form of the display of danger signals at unexpected places, the manipulation of home semaphore

and interlocking signals, removal of markers; extinguished lights, and the display of wrong numbers on caboose and engine indicators. In every test such as those mentioned, trainmen detected every signal and reported every error. The percent of efficiency shown by the total of tests conducted on every division was 99.77. The few failures noted were mostly of a technical character, such as the observance of speed regulations and matters which do not involve the immediate element of risk.

It might not be a bad idea to experiment a little on your own employees and learn how effectively they can meet an emergency and how understandingly they are carrying out your ideas in the conduct of your business. You might stage an irate customer—or one who was looking for something out of the ordinary in your stock—and see how your salesmen meet the situation.

CO-OPERATIVE ELECTRICAL WORK IN THE INTER-MOUNTAIN COUNTRY

BY U. S. G. TODD

Nature's storehouse of electrical energy in the Rocky Mountain section is of such vast magnitude that its development, while it has made tremendous strides, is yet but in its infancy. Just at the present time, while our resources and energies are required in the assistance of the cause of Liberty, the advancement in any new project must of necessity be abandoned.

However, those who can see far enough in the future, may very conservatively predict that the trans-continental railway lines will be operated by electrical energy developed by these immense mountain resources.

In a general way one can conceive in a very limited view of the possibilities of water power development, without having had a personal knowledge and close contact with mountain streams winding their way through the paths of least resistance in this mountainous country, and as increased activity and development of power is assured, the allied industries connected with the electrical business will of necessity expand and grow.

We have made such rapid strides in the electrical world since the perfection of the electric lamp that the phenomenal growth is being commented upon from all sides. It will be but a short time until the command, "do things electrically," will be practically obeyed, and this one thing will result in a very practical reduction in the production cost of almost everything required by the consumer.

Co-operation by the allied electrical men will perhaps have more to do with winning the war than any other one line of industry, for by electricity we not only produce but we conserve. Indeed, we materially strengthen and develop the national resources that would have otherwise remained dormant.

There is no greater satisfaction.

BUY A LIBERTY BOND



NEEDED:—COMMUNITY OF INTEREST

BY T. E. BIBBINS

(Not socialism—but an ideal of co-operation, which is a very different thing—is coming to be the watch-word of the electrical industry in the West. A plea for general good feeling and for specific good dealing between branches of the industry is here made by a man who has always stood for the best in these ideals. This article by the president of the Pacific States Electric Company is submitted as a part of the report of the Commercial Committee for the Pacific Coast Section, N. E. L. A., convention of next month. —The Editor.)

In the days of long ago the electrical jobber, when confronted with an infraction of a rule or price by his competitor, found a method of disposition which we can tell about today because of the statute limitations. The offender was brought before the court and tried, and if found guilty he was punished by the levying of a substantial fine, or in some other effective way. The Department of Justice at Washington and its enlightening influences have shown the inadequacy of this, to say nothing of the hazard to one's freedom of movement or the choice of wearing apparel. A better way by far has been found. Today, instead of discussing the question of price, the electrical jobbers as a class find it better to discuss a principle involving the ethics of business, resulting in the recognition of the right of others to live, and to do business and prosper.

One of the strong factors in bringing this condition about was the gradual growth of confidence in each other, and odd as it may sound, this confidence has been established best through a method of play, such as golf, and other pastimes, where the qualities of the sportsman are brought out and developed to a high degree. The facilities for knowing the true worth of a man are greatly helped where the jealousies of business are set aside and the competitor assumes the role of play-fellow. As a development of discussion, one of the earlier lessons in our primary class was that an investment, if wisely placed, was entitled to earn a fair return. In the case of a bond, the returns are proportionately small. When money is invested in merchandise and in the giving of service a greater return is necessary. It did not take long to learn that after the dollar is invested in the merchandise, 15 cents must of necessity be added to this, in order to pay for the cost of warehousing the merchandise the dollar has purchased, rent, clerical hire, sales effort, etc., and if the merchandise is sold for \$1.15, then not even the small rate of the bond interest would be returnable, and in that case we are simply swapping dollars. Therefore, it is necessary to again add a sufficient amount which would justify the investment in the merchandise after the 15 cents has been added to the dollar.

Other and more profound questions dealing with business problems have been developed as a result of these discussions. Undoubtedly there have been many unethical practices set aside as a result of the searchlight of discussion.

The wholesale merchandiser—the electrical job-

ber—has his problem, and this obviously he cannot discuss with his competitors, as to how much money he is warranted in spending in the way of investment in merchandise, which he anticipates should be sufficient both in quantity, quality and assortment to serve his other friends in the electrical business. He must watch the horizon, with all the keenness of a troubled skipper of the ship for the storm which may break over his head and show itself in declining demands, leaving on his hands a merchandising investment out of proportion with the reduced volume of business, and the depreciated value is a danger here. Under the circumstances, when he considers the amount for his compensation on his material he must include a fair amount in insurance against this depreciation. He must incur other expenses—he must find means of letting the buyer know that he has the goods on hand. This is a function of advertising and salesmanship—all of which costs money. These and other burdens are responsible for the large cost of handling, beyond which he must have his reasonable profit—a profit which, after this expense is met, offers a fair return on his investment.

Do you, as a contractor-dealer, ever consider what the stand-by service of a jobber means? Instead of bearing the burden on your own shoulders by way of investment in stock to make your own service continuous, he carries this for you. It represents from 5000 to 7000 different articles. It includes the production of a great many manufacturers. We can do this much cheaper for you in the end than for each one of you in turn to perform a service for yourselves. Have you through your purchasing agents recognized this fact? We must recognize that you in turn because of the necessity for an adequate net return must place your investment wisely, but in the end we feel that the price which you may pay us individually will be justified when the full recognition of the service which we offer is kept in mind.

We have no exclusive claim to the convention idea. We have listened with great profit to the treatment of problems in assemblies of contractor-dealers and light and power associations. We do feel, however, that the idea of personal contact has been carried to a further degree by the electrical jobbers, and with great profit—if the pleasure of doing business along fair, clean lines may be called profitable.

There is no doubt but you who represent the other classes of the industry are by the convention idea finding and expressing in clearer tones your problems, and in some instances finding the answers to them.

Again—what we most need is the co-ordination down the line. There is every indication that the organization heads are strongly in favor of the cordial

Those others gave their all—



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relation. Has the message been earnestly given to those who go to make up your organization?

To meet at Del Monte for a discussion on mutual subjects may be useful, but fail utterly of the effect if the problem is not carried to all corners of our geographical section—to all cities, to all towns, and to all people associated. This is somebody's problem. Is it not yours? And if it is yours, should you not drive the question home to everybody?

There is also developing a movement of the Bolsheviki or I. W. W. type that requires close study. One offshoot of this movement lends encouragement to the attack on capital in general and public utilities in particular. I need hardly call attention to the heading on the first page of one of the dailies: "This Paper Is Committed to the Policy of Public Ownership of Public Utilities." This is but one symptom of the direction of movement. Another can be found if we but spend a few hours studying the system employed in one of our larger cities, which to our mind is destructive in nature, where the municipally owned vehicles seem to be placed to produce the deadly parallel. The handwriting on the wall seems plain to me—we have but to listen to the utterances of our representatives in Congress on the government control of railroads, to hear expounded theories which, if carried too far, will in our judgment be destructive of our national wealth, to say nothing of the effect on our industry.

If this danger was the sole motive for our closer relation, it would be enough.

What we need most is the development to a high degree of the community of interest among all men in our fraternity. The message seems plain to me. This will not be a matter of accident if it is brought about—rather one of earnest striving, intelligently and patiently directed. It is a great need. The movement was under way—prior to Riverside—but taking shape there, has been given further recognition at this Del Monte meeting.

There is a grave question whether it is the duty of the president or general manager to know and be able to address familiarly the clerks—the wiremen of the other branches—in fact it is not only impracticable, but impossible. But it can be established as a policy of the company that a man in the organization, other things being equal, has greatest value in the mind of the management when he shows this ability to make friends. It should not alone be his duty, but a pleasure. There never was a time when staunch friends are so needed by the lighting and power companies. Are you satisfied that your people understand this gospel? Have you encouraged them to establish a relation where they cordially call the dealer on the street as "Tom" or "Bill"? Let them be able to meet the contractor-dealer with conscience free from intended offense. Let the dealers promote the best feeling toward the central station. Let them forget for all time the criticism and bickerings. My personal observation is that this spirit is not lacking among the officials on any side, but somehow or other, the officials have not succeeded in getting the message to the subordinates, so that they in turn will enthusiastically assist the contractor-dealer in the problem of living, and therefore, the elimination of killing practices—

for instance, wiring at cost, the selling of goods at cost, or other practices which are generally recognized as unethical.

Let me anticipate the boomerang coming my way by saying that the jobber is by no means perfect—far from that—he is struggling in the meshes of his own infirmities—many practices now in effect should be abandoned. Our disposition is to do this—so when we offend, deal out the criticism and give us the help to correct the offense.

It would be most unfortunate if this movement should be misinterpreted as an informal combination to restrain operations of any kind—far from it—we should let it be known that we seek nothing by way of favor except that which our legitimate striving along efficient lines will earn for us.

The practical end to all this has arrived when the community of interest in each city, town and hamlet is developed, where our questions are sympathetically discussed by all branches of the industry, and speedy conclusions are arrived at, resulting in unified action; all in accordance with the principles of law and order. This spirit of co-ordination will be developed greater in some localities than others. The ideal will have arrived when the Golden Rule is practiced in our relations—do unto others as we would have them do unto us. The development of this happy condition of affairs is difficult, but its attainment is possible—never will it be accomplished without great toil, untiring patience and thankless effort. As it is fruitful of good for all—not the least the general public—it is worth while. We will all greatly benefit by it. For those most dependent on the popular opinion it will furnish a flywheel effect—carrying over the valleys of criticisms (these come no matter how undeserved). For the man whose business is to sell—he is not seriously concerned as to the attitude in this branch of the industry—so his mind is free to devote his entire energy to his own problems.

POWER ON THE FARM

There is an old proverb that "the mill will never grind with the water that has passed," but, according to the Farm Journal, here is an instance in which the water was given a new chute and the mill is now doing more than it ever did in a very long history. The mill had been abandoned, but by the use of cement it was given a new race and its wheel connected with an electric generator. It is now furnishing the current with which to illuminate a whole farm; and by making use of a portable motor and extension wires, machinery at different points on the farm and in the home could be given abundant power. Washing machine, churn, sewing machine, vacuum cleaner, etc., could thus be easily operated, much to the delight of the housewife. Water could be pumped, wood sawed, feed ground, silage cut, etc.; perhaps some extra power could be sold to the neighbors.

Germany doubts our sincerity—

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WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(There is no better investment than a good patent—but an investor should be sure of two things: He should know the commercial value of the article patented, and he should make sure that the patent itself covers his rights. A loosely drawn application whose claims do not cover the whole situation, would have little worth, for it might allow competitors to utilize the very element, perhaps, which makes for commercial success. The authors of this interesting article are prominent patent attorneys of San Francisco.—The Editor.)

THE PATENT SYSTEM

In view of the large number of patents being issued annually, it is to be expected that a large proportion of them cover inventions of no great value. Of course, the value of a patent depends primarily upon the value of the invention disclosed. The issuance of a patent does not increase the intrinsic value of an invention. The fact, therefore, that many patents are of no value, because the inventions respectively covered by them are practically worthless, should not influence one to consider all patents poor investments.

There is no form of investment that yields a larger return than a broad patent on an invention that supplies a general public want or need. Furthermore, the monopoly granted by such a patent is given ample protection by the courts. Nine times out of ten, the man who complains about the lack of protection given patent rights, is the owner of a patent having no value by reason of not disclosing an invention having any value or by reason of being based on an application improperly and unskilfully prepared.

Before investing in a patent, one should obtain expert advice; first, in respect to the intrinsic value of the invention disclosed, and, second, in respect to the value of the patent claims as a grant of a monopoly of the whole invention. As stated before, a patent may disclose a valuable invention, but not properly or completely claim it; and the scope of the monopoly, granted by the patent, depends primarily upon the claims of the patent and not upon what is disclosed in the drawings or is described in the specification of the patent.

Furthermore, it is the commercial value of the invention that should be investigated. A patent may cover a wave-motor which operates successfully, but, nevertheless, is a commercial failure due to the fact that power can be generated more cheaply by the use of oil or coal. It is estimated that the new steam plant of the Buffalo General Electric Company at Tonawanda, N. Y., will generate electricity from coal more cheaply than can be done from the waters of Niagara Falls.

The importance of maintaining a patent system which affords the inventor ample protection and which, in fact, does "add the fuel of self-interest to the fire of genius," was well expressed by Mr. Edmund Wetmore of New York in his address before a recent meeting

of the American Bar Association. Mr. Wetmore closed his address with the following remarks:

"The fact that patent laws are primarily for the benefit of the public and not to make inventors a favored class is not as widely understood as it should be. Patents are granted to encourage the making of inventions and to insure their finally becoming public property instead of remaining secrets or being lost or forgotten. And this can only be accomplished by an efficient patent law. This was admirably shown by Mr. Fish in his paper read at the last meeting of the association, in which the point was strikingly illustrated by the instances of those countries that had reinstated their patent laws after the experiments of abolishing them. A study of facts and statistics will show that patented inventions lie at the bottom of the conveniences, the comforts and the opportunities of our present mode of life, and without which our civilization would cease to advance. Appealing to considerations that come home to all, the influence of patented inventions tends directly to bring down the cost of living in the three essential particulars of rent, food and clothing. As to rent and food, because of the vast extension which patented inventions have produced in the facilities for transportation, whereby not only are the regions which constitute the suburbs of our great cities brought within easy reach of the centers of trade and the source of employment, but long distance transportation, particularly as to food products, opens up the regions where there may be a surplus to those in which there is a deficiency; and as to the matter of clothing, the numerous and accumulated inventions relating to the machinery employed in the production of clothes tend to bring the price of actual necessary clothing down to the lowest figure.

"Examples of the public benefit derived from patented inventions, familiar enough to those who have studied the subject, might be multiplied indefinitely for the purpose of bringing that fact home to those who have not given it sufficient consideration, and as to the enormous results which follow from inventions originally protected by patents, a more striking instance cannot be found than that shown in the present gigantic war. There are three inventions which in a large measure control the conflict and have changed the whole art and strategy of war, namely, the aeroplane, invented and patented by the Wrights; the automobile, covered by numerous patents; the wireless telegraph of Marconi—not to speak of the inventions relating to artillery, heavy and light, to the machine gun and to the rifle, some of which have been kept as government secrets, but the majority of which have been patented in the country of their origin.

If you don't vote you help to elect
the other fellow.

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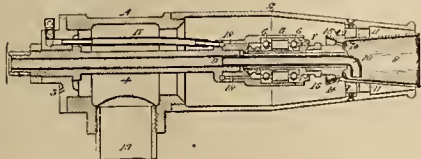


"These, as it seems to me, are some of the topics by which a public feeling may be aroused that must in the end check ill-considered legislation directed against our patent system, and which, if unchecked, would gradually destroy it by piecemeal."

WESTERN INVENTIONS

Centrifugal Oil Burner

Patent No. 1,255,592, issued to Milton A. Fesler, of San Francisco, California, discloses a novel form of oil burner. The burner consists of a horizontal cylindrical casing having arranged in one end thereof a horizontal rotating cup into which the fuel oil is fed through a central pipe. The edge of the cup is spaced from the casing, so that an annular



passage is formed between the cup and the casing. The oil is discharged radially from the edge of the cup and passes over the annular passage where it encounters and is mixed with a discharging stream of air caused by blower vanes on the outer face of the cup within the casing. To prevent a whirling movement of the air discharging through the annular passage, a series of fixed direction blades are formed on the inner face of the casing adjacent the discharge end and the air from the blower passes these blades before it is discharged.

Insulated Testing-Plug Terminal

Patent No. 1,255,824, issued to Milton H. Shoenberg of San Francisco, and Frank Talcott of Burlingame, California, and assigned to the Majestic Electric Development Company, shows a new form of plug terminal. The terminal consists of a body of insulating material having a longitudinal bore



therein enlarged at one end to form a recess. The contact member is arranged in the recess and projects beyond the end thereof and is provided with an integral spindle which extends through the bore and is connected to the conducting wire. Surrounding the contact member and fitted within the recess is an insulating sleeve and within the recess and bearing against the end of the sleeve is a spring which normally presses the sleeve outward so that its outer end projects beyond the end of the contact member. When the plug is pushed into engagement with the contact clips in the socket, the sleeve is pressed back to bare the contact member.

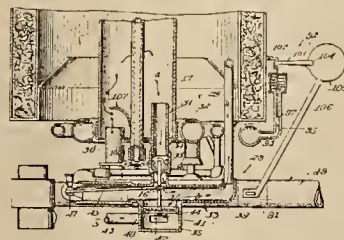
Process of Producing Iron and Steel

Patent No. 1,255,191 has been issued to Samuel McDonald, of Alhambra, California, for a process of producing iron and steel. This process consists in providing a molten body of iron ore on top of a molten charge of iron or steel and blowing a gas containing a reducing agent downwardly against the molten iron ore so that portions of the ore are carried below the surface of the charge of molten iron or steel and are thereby reduced to iron or steel. The gas employed is a non-oxidizing gas mixed with powdered carbonaceous material.

Water Heater

Patent No. 1,255,835, issued to Hugh G. Shaug, of Los Angeles, California, shows a new form of gas water heater. The heater is provided with primary and secondary burners, the primary burner being arranged to maintain the water in the heater at a constant temperature when water is not

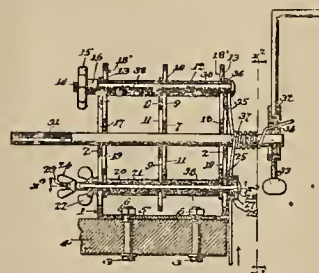
being used, and the secondary burner being of larger heating capacity and being arranged to be thrown into operation when water is being used. A water circulating system is disposed in the path of travel of the heat from the burners and means



are provided for maintaining the circulation of the water in one direction when the primary heater is in operation and for interrupting and reversing the direction of flow when the secondary burner is in operation and the degree of heat is increased.

Coil Forming Machine

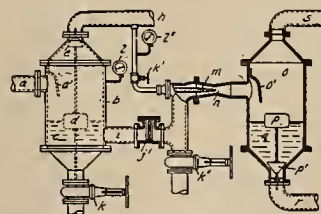
Patent No. 1,253,782, issued to Edgar J. Bryan of Riverside, California, shows a coil winding machine of new construction. The machine consists of a frame provided with



slidably adjustable bearing plates through which the arbor extends. The arbor is removable and longitudinally slidable in said bearing plates, and is provided with a handle for rotating it.

Process and Apparatus for Separation of Oils and Gases

Patent No. 1,255,018, issued to Philip Jones, of Santa Maria, California, discloses a process for separating gas from oil and also an apparatus with which the process may be practiced. The oil as it flows from the well contains gas which it is the object of this invention to remove and conserve. The oil is flowed under pressure into a closed tank which is of sufficient



size to reduce the velocity of the flowing mixture to such a point, so that the oil will settle. The oil is then passed out from the tank through a venturi tube and a portion of the separated gas passes from the tank through a nozzle arranged in the venturi tube, which causes the venturi to act as an injector, placing the oil under pressure in a second tank. In the first tank, the rate of outflow of the gas is determined by the level of the oil in the tank, so that the gas is maintained under pressure during the separation.

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SPARKS—Current Facts, Figures and Fancy

(Necessity being the mother of invention, the present world situation is bound to give rise to a horde of new ideas. Among those recently suggested to solve the problems of the war are the floating power plant and the "audible" glasses for the blind, presented below. A new substitute for celluloid and a new use for electric lights to save money in fish food are further recent experiments which promise new development along very different lines. Other odds and ends of electrical interest are also included in the digest.—The Editor.)

A non-combustible substitute for celluloid has been invented by a professor in a Japanese university, and is said to furnish satisfactory material for tiles, buttons and insulators. While not perfectly fireproof, the substance requires considerable heat to kindle, and burns very slowly.

* * *

Most of us felt a real spirit of daring when attacking our first whale steak, but whale meat has been used for hundreds of years in Japan. In the earliest books of Japanese history there are accounts of the capture of whales with nets and the ceremonies and feasting which followed a successful hunt.

* * *

A description of the living quarters of the American troops in some of the captured trenches of France pictures them in an old limestone quarry seventy-two feet underground. Fresh air is supplied by large air pumps. The cave is in part electrically lighted and provides excellent accommodations for our men.

* * *

It is only in America that they say "hello" over the telephone, but the word itself comes from foreign sources. According to one authority, it comes from the word "holler" with a Norse origin. Another credits it to the French hunting call, "Au loup!" (to the wolf) which was corrupted to "halloo" by the English and later to the "hello" with which we greet our telephone calls.

* * *

The way they do it in Russia is to confiscate your business if you have trouble with your help—and who does not?). One electric lighting company has been taken over recently by the Bolsheviki to prevent its being closed down. The decree requires that all the employees, including the technical staff, shall remain at their posts and continue their work. For unauthorized absence from duty, or sabotage, the guilty will be brought before the revolutionary courts.

* * *

A central duplicating bureau which issues thousands upon thousands of circulars, letters and pamphlets each day, is a feature of the Southern Pacific general office system. Mimeograph machines, electrically driven multigraphs, an automatic addressograph and machines for shaving used dictaphone cylinders so that they may be used again, are only a few

of the types of electrical instruments which make the work of this department possible.

* * *

The use of an electric light to catch fish is no new idea, but to feed them——! A Kansas state hatchery has installed electric lights above the fish ponds, with the result that large numbers of bugs and smaller insects are attracted to the vicinity at night. Eventually many of these fall into the water and are fed upon by the fish. In the past the cost of food for the finny creatures has been about \$1000 a year, but it is predicted that under the present arrangement this expense will be reduced.

* * *

A novel suggestion for an electrically driven bevy of ships which will carry a floating power plant with them comes from London. The suggestion is to have one set of detachable power producing machinery for three or more hulls, which would each be equipped with propellers and electric driving motors only, arranged for coupling by cables to the power plant. The power plant is apparently housed in a detachable and floatable poop, which can be continuously employed in propelling one or the other of the hulls, and can, in times of stress, be separated from the hull.

* * *

The advent of electricity in China, together with the increased transportation facilities and industrial developments, has brought the usual accompaniments of unavoidable accidents and sectional transfer of disease. In consequence, a study of human physiology is being permitted now which was absolutely forbidden before. Up to comparatively recent times the belief prevalent in both China and Japan was that the people of the West were made differently from those in the East. At least one Oriental text book on medicine shows a picture of the interior of the human body that has the various organs divided in much the manner of a modern office building with the elevator shaft as the connecting medium.

* * *

An instrument to enable the blind to "hear" light has been suggested by a French paper. The light detector would consist of a thermo-couple placed at the focus of a lens or parabolic reflector. The receiver would be a special type of telephone receiver consisting of a coil through which passes current from the thermo-couples, and a soft iron diaphragm traversed by intermittent current from a small Rumkorff coil. The intensity of the note emitted when light falls upon the thermo-couples of the eyepieces should make it easy to determine the direction of the sun or of a lamp or window.

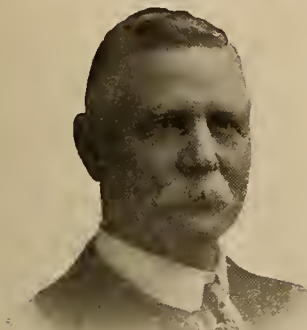


There is more reason to support a
republic than a despotism.

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PERSONALS

C. E. Grunsky, consulting engineer of San Francisco, has just returned from the national capital, where he has been



for the past eight weeks representing the interests of the Imperial Valley of Southern California in its plea for new legislation affecting the diverting of water from the Colorado River to the Imperial Valley. On his return from the East, Mr. Grunsky attended a conference of noted reclamation engineers at Yuma, Arizona, composed of national and state authorities, looking toward an early solution of many of the perplexing problems in the Southwest.

Three bills are now before Congress, one of which touches upon the power situation along the Colorado River. The passage of these bills will do much to alleviate the rather trying conditions through which these great reclaimed areas have been passing.

George H. Curtiss has resigned as salesman with the Pacific States Electric Company at San Francisco.

M. L. Joslyn, of Chicago, president of Baker-Joslyn Company, is spending a few weeks on the Pacific Coast.

John B. Matthews has become affiliated with the Moore and Scott Iron Works, Oakland, Cal., in the capacity of engineer.

Lewis E. Marsh, manager of the Specialty Shop for inventors at San Francisco, was recently married to Miss Violet E. Mills.

C. G. A. Baker, of San Francisco, vice-president of Baker-Joslyn Company, is at the Seattle branch of his company on business.

John W. Morton, formerly with the distribution department of the Pacific Gas & Electric Company, is now with the Union Iron Works.

Fred Wilkie, for the past three years assistant state engineer of Idaho, has been appointed state engineer, succeeding J. H. Smith, resigned.

F. M. Bernardin of the B. R. Electric Company, Kansas City, has been at Del Monte for some time and is to extend his visit for some days longer.

Second Lieutenant C. P. Taylor, formerly with the Pacific Gas & Electric Company, is at present on duty in the General Engineer Depot in Washington.

C. L. Cory, professor of electrical engineering at the University of California, is engaged in research work for the government looking toward the fixation of atmospheric nitrogen.

W. M. Deming, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, has returned to San Francisco after five weeks absence in the East.

John L. Radenbaugh, formerly in the installation department of the Pacific Telephone & Telegraph Company at Seattle, has been appointed manager and wire chief at Heppner, Oregon.

Daniel W. Mead, professor of hydraulics and sanitary engineering at the University of Wisconsin, and a well-known authority on water supply investigations, is a recent San Francisco visitor.

H. H. Lyons, superintendent of the Ordway (Colo.) division of the Arkansas Valley Railway, Light & Power Company, has been appointed local organizer for the sale of Thrift and War Stamps.

Lieutenant Hale, formerly connected with the Pacific Gas & Electric Company offices at San Jose, who was last reported at Vancouver, is now located at Fort Meyer with the 37th Engineers.

H. L. Fitch, toll traffic chief of the Pacific Telephone & Telegraph Company, San Francisco, left March 10th to take up new duties with the American Telephone and Telegraph Company in New York.

H. H. Jones, manager of the San Diego Consolidated Gas & Electric Company, San Diego, Cal., has been appointed chairman of the finance committee of the San Diego branch of the American Red Cross.

C. G. Hyde, professor of civil engineering at the University of California, is prominent on the list of those of the faculty doing war service, as the designer of fifteen miles of sewer system for Camp Fremont.

G. A. Kyle, of the engineering staff of the Siems-Carey Railway & Canal Company of China, operated by the American International Corporation, is a former Portland man recently captured by Chinese bandits.

W. W. Lowe of the Electric Appliance Company, Chicago, and his wife and daughter, have been spending some time on the coast. They have been visiting at Del Monte and are returning now, via Portland, to Chicago.

Henry A. MacNamara, former manager of the Pacific Telephone & Telegraph Company at Hollister, has been detached from an infantry regiment at Camp Lewis and sent to Washington for service in the signal branch of the army.

J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, has returned from Southern California, where he has been engaged in helpful personal work for the association during the past three weeks.

Hugh Trainer, for many years connected with the East Las Vegas, N. M., office of the Mountain States Telephone and Telegraph Company, has been appointed to the position of manager of the company's exchange at Alamosa, Colo.

Al Youngholm, credit man for the Electric Railway & Manufacturers Supply Company of San Francisco, has severed his connection with the company to become secretary and manager of the Apex Manufacturing Company in Oakland, Cal.

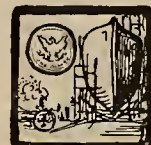
Edward Whaley, formerly secretary and general agent of the Northern California Power Company, was made general manager at the recent annual meeting of the company. W. H. Pearce, former assistant secretary, was promoted to the position of secretary.

D. J. Butts, Los Angeles manager of the Western Electric Company, has recently brought out new ideals in practical co-operative effort among manufacturer, jobber, central station, and contractor-dealer. At the launching of the Electrical Co-operative Campaign in Los Angeles on the evening of March 15, 1918, Mr. Butts showed how every element must harmonize with the whole, or, like the stubborn ass athwart a beautiful California highway, the traffic of a commonwealth may be interfered with by one single unit. His forceful remarks are printed in full elsewhere in this issue of the Journal of Electricity.



It is only a temporary self-denial.

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Professor C. E. Lucke, formerly chief of the mechanical department of Columbia University, now a member of the aviation corps, accompanied by an aide, Lieutenant R. D. Kirkpatrick, has been spending some days in San Francisco.

R. H. Husbands, formerly Los Angeles manager for Pier-son-Roeding & Co., who has retired from the selling agent field, has been put in charge of high tension insulator sales for the Pacific States Electric Company at Los Angeles.

F. E. Pernot, assistant professor of electrical engineering at the University of California, has taken a leave of absence from the university in order to assist the government at Washington in certain radio work for the aviation service.



Officers of the 405th Tel. Batt., Signal Corps, N. A., Camp Lewis, Wash. (from left to right): 1. First Lieut. E. M. Brown, Co. E, Emp. Tel. Dept., Santa Fe Ry., Newton, Kansas. 2. First Lieut. Wm. E. Liggett, Batt. Adjt., Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 3. Captain Edward W. Sloan, Commanding Co. E, Emp. Western Union Tel. Co., Minneapolis, Minnesota. 4. Major John A. Kick, Commanding Batt. Emp. Western Electric Co., New York City, N. Y. 5. Captain Alex. W. Young, Commanding Co. D, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 6. First Lieut. Edgar C. Fisher, Co. E, Emp. Western Union Tel. Co., San Francisco, California. 7. First Lieut. E. R. Hannibal, Co. D, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado. 8. First Lieut. C. F. Kunsemiller, Batt. Sup. Officer, Emp. Mountain States Tel. & Tel. Co., Denver, Colorado.

George A. Damon, a consulting engineer of Los Angeles, and local representative of Bion Arnold, is doing splendid work in Southern California looking toward encouraging engineers generally in undertaking helpful civic work in these days of national emergency.

F. J. MacGougan, general commercial superintendent of the British Columbia Telephone Company, and F. L. McNally, district commercial superintendent at Seattle, were recent visitors at Spokane, attending the fifteenth district conference of the Rotary Clubs of America.

G. E. McFarland was re-elected president of the board of directors of the Pacific Telephone and Telegraph Company at their annual meeting, held in March. Vice-presidents are H. D. Pillsbury and J. M. Quay; secretary and treasurer, F. W. Eaton; general manager, J. C. Nowell; general auditor, F. C. Phelps.

M. P. Macmillan, manager of the Reno exchange of the Pacific Telephone & Telegraph Company, has been appointed a member of the Nevada State Fish and Game Commission by Governor Boyle. This is a decided compliment to Mr. Macmillan's good citizenship and popularity in the state of his residence.

O. C. Merrill, chief engineer of the Forestry Bureau at Washington, who was for years a resident engineer of the Forestry Service at San Francisco, is taking a very important

part in formulating new water power legislation at the national capital, comment on which may be found on the editorial page of this issue.

George J. Walton, local manager of the California-Oregon Power Company at Klamath Falls, has charge of the work there on the military map which the company is making of southern Oregon and northern California. The company in this case is not only mapping its own projects but acting as an agent for the government.

Paul M. Lincoln, commercial engineer for the Westinghouse Electric & Manufacturing Company, and a past president of the American Institute of Electrical Engineers, is a recent Pacific Coast visitor. At Los Angeles Mr. Lincoln was an interested attendant at the large get-together banquet on March 15, 1918, described elsewhere in this issue.

C. B. Hall, general manager of the Illinois Electric Company at Los Angeles, and Miles Steel, Pacific Coast manager of the Benjamin Electric Manufacturing Company, with headquarters at San Francisco, have returned from a several weeks sojourn in the Hawaiian Islands. The skies proved brilliantly alluring, the flying fish entrancing, the volcano at Kilauea inspiring, and so Mr. Steel— [deleted by the censor].

Harry W. Alexander, director of publicity, The Society for Electrical Development, New York, has resigned to become assistant to president on sales, American Writing Paper Company, New York and Holyoke, Mass. Mr. Alexander is succeeded by Roy B. Woolley, now in the society's publicity and sales department, but late of the American Ambulance Field Service, Verdun sector, France. Mr. Woolley was formerly sales manager, Standard Electric Stove Company, of Toledo.

D. E. Harris, vice-president of the Pacific States Electric Company; L. H. Newbert, manager of the commercial department of the Pacific Gas & Electric Company; Albert H. Elliot, secretary of the Pacific Coast Electric Supply Jobbers Association; Robert Sibley, editor of the Journal of Electricity; and J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, attended the splendid gathering for bettering co-operative helpfulness among men of the electrical industry, held at Christopher's, in Los Angeles, March 15, 1918.

Chester Pennoyer, formerly manager of the San Francisco office of the National Conduit & Cable Company, has



gone East to become general sales manager for the company. James E. Crilly of Holabird Electric Company at San Francisco, has been made San Francisco manager of the National Conduit Company.



Show that you believe in the President's last message.

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Garnet Young of Garnet Young & Company, San Francisco, was in Portland recently.

George Oates has resigned from the district managership of the Utah Power & Light Company at Rexburg, Idaho.

T. E. Bibbins, president of the Pacific States Electric Company, was in Portland recently and is spending two weeks in the Northwest.

R. B. Wiseman, proprietor of the Electric Supply and Fixture Company, Ellensburg, Washington, spent several days as a recent Seattle visitor.

Carl A. Wolfrom has been promoted from assisting operating manager to district manager for the Utah Power & Light Company at Rexburg, Idaho.

Thomas McCauley, general superintendent and electrical engineer of the municipal government of Calgary, Alberta, was a Seattle visitor some time ago.

Walter D. Sultan, formerly with the rate department of the Pacific Gas & Electric Company in San Francisco, has been made a captain in the Aviation Service.

Joe E. King has been transferred from the post of local superintendent for the Southern Sierras Power Company at Corona, Cal., to a similar position at San Bernardino.

Walter Cary, vice-president of the Westinghouse Electric & Manufacturing Company, and vice-president in charge of the Westinghouse Lamp Company, was in San Francisco recently.

W. S. Berry, sales manager for the Western Electric Company on the Pacific Coast, headquarters, San Francisco, was in Portland recently while making a trip through the Northwest.

H. D. Stephens, manager of the generator section, power department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, visited Seattle and other Pacific Coast centers in the interest of company business, recently.

Burton R. Stare of Burton R. Stare Company, dealers in electrical apparatus and specialties, Seattle, recently returned from a three weeks business trip to the East, during which time he visited Chicago, Milwaukee, Cleveland, New York and St. Louis.

James B. Black, formerly assistant general agent of the Great Western Power Company at San Francisco, has taken over the duties formerly discharged by W. W. Briggs, resigned, and has been given the title of general sales manager of the Great Western System.

S. V. Wellman of the Wellman, Seavor, Morgan Company, Cleveland, Ohio; **W. B. Hall** of Pass & Seymour Co., Solvay, New York; **H. J. Armstrong** of the Smith-Booth Usher Company, Los Angeles, Cal., and **Foster C. Gibson** of the Edison Storage Battery Supply Company, of Seattle, Wash., were recently in San Francisco and attended the luncheon given by the San Francisco Development League in honor of Samuel Insull.

S. E. Hutton, for several years head of the mechanical and electrical engineering departments at the University of Idaho, recently enlisted in the United States army at Spokane, Wash., as a private in the aviation section of the Signal Corps. Mr. Hutton was formerly consulting engineer of the Idaho State Public Utilities Commission and on the faculties of Highland Park College at Des Moines, Iowa, and the University of Kansas.

Samuel Insull, president of the Commonwealth Edison Company of Chicago, the largest producer of electricity in the United States, is a recent San Francisco visitor. A notable gathering in honor of Mr. Insull was held on March 27, 1918, at the Palace Hotel, with the San Francisco Electrical Development League as hosts and members of the National Electric Light Association and the American Institute of Electrical Engineers as guests.

John H. Lewis, state engineer of Oregon, has gone to Washington, D. C., to urge the immediate execution of the state's contract with the United States so that construction

work may commence immediately on the 46,000-acre Jordan Valley Carey act project. He will also take up with the department a number of other questions affecting Central Oregon irrigation projects, which have been long delayed, such as the issuance of patents on the Central Oregon and Tumalo projects.

J. Harry Sroufe, of the Jaggar-Sroufe Company of Portland, was unanimously elected president of the Portland Association of Electrical Contractors and Dealers at their last meeting, Allen S. Halls having resigned. Mr. Sroufe has during his entire period in Oregon been an active worker in the association affairs, and his election as president comes as a reward of his earnest and conscientious efforts along the association line, and the electrical fraternity of Portland are glad and indeed fortunate to have, as the head of their organization, so capable and worthy a gentleman.

OBITUARY

E. K. Patten, western manager for the Bryant Electric Company, with headquarters in Chicago, died at his home in Chicago, Sunday, March 24, 1918.

Charles H. Williams, who was well known among Western public utility operators, died in Denver, Colorado, on March 10th, of pneumonia. He was 44 years of age. For the last half dozen years Mr. Williams had been engaged in building and operating gas and electric plants in many of the smaller cities of the West.

Carlton H. Parker, professor of commerce at the University of Washington, died of pneumonia in Seattle on March 16, 1918. Mr. Parker was well-known among men of the electrical industry up and down the Pacific Coast, due to his helpful work in settlement of industrial disputes, especially among I. W. W. agitators. A widow, three young children, and a host of friends bemoan his loss.

C. B. Lamont, one of the West's foremost structural engineers and inventors, died in Seattle recently of pneumonia, at the age of 41 years. For many years he was assistant to the president of the Seattle Construction and Drydock Company. His first commercial connection after being graduated from Cornell University was with the Union Iron Works of San Francisco. He superintended many engineering enterprises in Seattle, Portland and Spokane, and for several years was consulting engineer for the White Pass & Yukon railroad.

Joseph D. Quay, vice-president of the Pacific Telephone and Telegraph Company, died in his room at the Pacific Union Club recently, after fifty years of winning many friends in San Francisco and losing none. He would have been 82 years old on March 27. Quay came to California from Hudson, Ohio, his birthplace, in the sixties. He was employed by the old publishing firm of Roman & Co., for a few years, and then entered the stock exchange in the bonanza days. In 1870 Mr. Quay became assistant secretary of the old Union Club, serving in that capacity for ten years. Formerly Mr. Quay was a director of the Spring Valley Water Company and other corporations.

Errata: In the article of L. R. Jorgensen on Advances in Multiple Arch Design, appearing in the Journal of Electricity, March 15, 1918, the two following typographical errors should be noted: Cross out the word "not" in the eighth line from the bottom of page 286, first column. Substitute "larger" for the word "smaller" in the third line, page 287, first column.

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MEETING NOTICES FOR ELECTRICAL MEN

(A joint meeting of the Engineering Societies of the San Francisco Bay region in honor of Professor Swain, at which some three hundred members were present, was one of the many important gatherings of the last two weeks. Interesting plans are reported from the Nevada Section, A. I. E. E. An epoch-making dinner which served to launch the California Co-operative Electrical Campaign in Los Angeles is reported elsewhere in the Journal. Particular note should be made of the change of dates of the coming Del Monte Convention from April 24th-27th to May 9th-11th.—The Editor.)

Joint Engineering Banquet in San Francisco

Three hundred distinguished engineers representing the five national engineering organizations dined at the Palace Hotel on the evening of March 20, 1918, in honor of George F. Swain, the noted engineer who gave the Hitchcock lectures at the semi-centennial celebration of the University of California, as announced in the Journal of Electricity, March 15, 1918. President Benjamin Ide Wheeler of the State University was first introduced by Robert Sibley, editor of the Journal of Electricity and chairman of the committee of arrangements. Then followed other intensely interesting speeches by Paul Downing, chief engineer of the Pacific Gas & Electric Company, on "Interconnection of Power Plants"; "Fuel Oil Saving" was discussed by David M. Folsom, Pacific Coast Fuel Oil Administrator; "War Problems of Public Utilities," by Max Thelen, president of the California Railroad Commission; and "National Issues of Today" by George F. Swain, professor of civil engineering at Harvard University and the Massachusetts Institute of Technology.

C. D. Marx, acting president of Stanford University and a past president of the American Society of Civil Engineers, fittingly introduced the latter speakers.

The general theme that ran through the various discussions was of a highly patriotic character, and those attending went away with a distinct feeling of patriotic fervor which led each to make a new resolve to be of better and higher service in assisting the national government in meeting the present day emergencies.

Nevada Section, N. E. L. A.

A meeting was held in Reno, March 11, 1918, and arrangements made to hold a session of the Nevada Section of the National Electric Light Association, at Reno, April 13, 1918. F. O. Broili was appointed chairman of the Program Committee.

It is earnestly requested that the different members of the committee extend a pressing invitation to all engineers and others interested in the electrical and mechanical industry to attend this meeting.

The Engineers' Club of the University of Nevada are joining in to help make the meeting a success. Many members of the committee have attended affairs where the Engineers' Club have been hosts and know that they always are able to get up something worth while.

The members are also requested to prepare an article, be it ever so short, on some subject which they think appropriate.

Several things have been proposed in the way of "Safety First," to be brought to the attention of the electrical fraternity at this meeting. This part of the program will be handled by Mr. George Smith, chairman of the Industrial Insurance Commission, assisted by Professor C. R. Hill of the University of Nevada.

Los Angeles Jovian Electric League

The Los Angeles Jovian Electric League meeting for March 13, 1918, which initiated its meetings at the American Cafe, proved unusually interesting. P. C. Ensley, of Graham-Reynolds, as chairman of the day, proved himself an able executive. Seward A. Simons, an attorney of Los Angeles, spoke on "The Bright Side of the War," and roused his hearers to a high state of optimism and patriotic fervor. The convention committee of the Pacific Coast Section, N. E. L. A., attended the meeting in a body, among them being R. H. Ballard, A. B. West, E. R. Northmore, W. L. Frost, J. W. Redpath, W. M. Deming and Robert Sibley.

Under the able presidency of H. N. Sessions, of the commercial department of the Southern California Edison Company, the Los Angeles League

is going ahead by leaps and bounds, and it is believed the meetings will prove a helpful factor in helping to solve the problems of the industry during coming months.

San Francisco Electrical Development League

On March 13, 1918, Professor B. M. Woods of the University of California, who is dean of the federal aviation school at the university, gave a very inspiring talk on the history and present progress of the art of flying.

Dr. Charles Cestre of the University of Bordeaux, France, and delegate of the French government to the University of California centenary, spoke at the meeting of March 20, 1918, on the "Economic Phases of the War." Robert Lloyd, leader of the chorus music at Camp Lewis, aroused the audience, which was a large and enthusiastic one, to a high pitch of patriotism by getting the entire number present to sing several of the camp songs, which were learned impromptu in two or three minutes time under his able leadership.

BUILDERS OF THE WEST—XXVI



S. M. KENNEDY

When we inspect the workings of some giant man-of-war or some physical structure that may perchance adorn a great city, it is a comparatively easy matter to properly pay homage to the builder. But for the man who builds a giant machinery whereby the marketing of unseen electric energies may be efficiently brought about, it is difficult indeed to properly appraise the high value of service rendered. It is, as a consequence, with unusual deference and affection that this issue of the Journal of Electricity is dedicated to S. M. Kennedy, general agent of the Southern California Edison Company, for he has built an enduring monument in the great Southwest that not alone efficiently markets the product of his company, but with it all a monument that constantly points to a truer and more effective ideal of citizenship.



"Our boys" are no more responsible for this war than are you.

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The meeting of the League of March 27, 1918, was held in honor of Samuel Insull, president of the Commonwealth Edison Company of Chicago. As Mr. Insull is a national figure in utility life his remarks on public questions of the day relating to utility life were listened to with unusual interest. The meeting was held in the Ball Room of the Palace Hotel and proved to be the largest gathering of the current year.

Program for Annual Convention of Northwest Electric Light and Power Association, to Be Held in Portland, September 11, 12, 13 and 14, 1918

Wednesday morning, September 11—General meeting.

Wednesday afternoon—Report of Public Policy Committee and paper to be announced later.

Thursday, September 12, and Friday morning, September 13—Paper and general discussion on emergency and war problems, along the following lines:

- (a) Financing. Author to be announced later.
- (b) Extensions: Costs; Justifications for; Method of Financing. Messrs. Stacey Hamilton, L. A. Lewis and C. R. Young.
- (c) Service Contracts: Value and Importance of Saving Clauses, Etc. By Robert W. Clark.
- (d) Diversifying Customers' Loads. By J. R. King.
- (e) Limitation of New Business Activities During War. By W. H. Lines, G. C. Sawyer and Mr. Boykin.
- (f) Interconnection of Systems and Elimination of Duplication. By Messrs. Merwin, Quinan and Greisser.
- (g) Stores and Purchasing Problems: By Mr. Shenkle.

Friday afternoon will be devoted to the report of the Electric Range Committee.

The above statement covers only the program and does not take into consideration the details of entertainment which will be announced later.

National Association of Electrical Contractors and Dealers

The National Association of Electrical Contractors and Dealers has permanently established their headquarters at 110 West Fortieth street, New York City, Room 1703, dating from March 20th.



A. MAGNIFICENT JOINT BANQUET OF FIVE NATIONAL ENGINEERING SOCIETIES

Here is the most brilliant gathering of engineering talent in the West during the current year. The occasion is a dinner given to George Fillmore Swain, the noted engineer and teacher from the East, who gave the Hitchcock lectures at the semi-centennial celebration of the University of California. The banquet took place at the Palace Hotel in San Francisco, March 20, 1918. Standing at the speaker's table, from left to right, are:

Chas. H. Delany, steam power specialist, Pacific Gas & Electric Company, Secretary of the San Francisco Section, A. S. M. E.
 R. A. Thompson, engineer for the Interstate Commerce Commission.
 Andrew Lawson, professor of geology, University of California.
 Bryant Drake, chemical engineer, Union Iron Works, secretary San Francisco Section, A. C. S.
 Frank H. Probert, dean of the College of Mining, University of California.
 L. D. Ricketts, consulting mining engineer and past president, A. I. M. E.
 George W. Dickie, noted naval architect, formerly with Union Iron Works.
 Paul Downing, chief engineer electric generation, Pacific Gas and Electric Company.
 C. D. Marx, acting president Stanford University, past president A. S. C. E., and toastmaster of the evening.
 Allen Jones, engineering staff, General Electric Company, and secretary San Francisco Section, A. I. E. E.
 Chas. Gilman Hyde, professor of sanitary engineering, University of California.
 Chas. Derleth, Jr., dean of the College of Civil Engineering, University of California.
 George Fillmore Swain, professor of civil engineering, Harvard University and the Massachusetts Institute of Technology, and past president A. S. C. E.
 Benjamin Ide Wheeler, president of the University of California.

Robert Sibley, editor Journal of Electricity, and in charge of meeting representing the five local sections of the national engineering societies.

Max Thelen, president of the California Railroad Commission.
 Jerome Newman, consulting engineer and president of the San Francisco Section, A. S. C. E.
 David M. Folsom, professor of mining, Stanford University, and Pacific Coast Fuel Oil Administrator.
 Albert S. Schwabacher, Federal Fuel Administrator for California.
 Elwood Mead, professor of rural institutions, University of California.
 Lars Jorgensen, consulting engineer and president of the San Francisco Section, A. I. E. E.
 Edmond O'Neil, acting dean of the College of Chemistry, University of California.
 M. M. O'Shaughnessy, chief engineer for the city of San Francisco.

Prove we are idealists—

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WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Nevada Section

Chairman—Geo. A. Campbell, Reno, Nev.
Next Meeting—April 13th.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittcock Block, Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
March 16th—Lieut. Harry W. Lake—"French Warfare and Personal Experiences in the War."

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
March 19th—L. S. Goodman and W. J. Jackson—"Effects of War Conditions on Cost and Quality of Electric Service."

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
March 15th—J. J. Curran, V. H. Griesser, T. E. Halsey—"A Little Light on Lighting."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hoppold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Executive Committee—at-Large—W. D. Kohlwey, California; Executive Committee—S. C. Jagger, Portland.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggard-Sroufe Co., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—Sam H. Taylor, 84—2nd St., San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Last meeting: Del Monte, January 24.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next Meeting—Del Monte, May 9-11, 1918.

They get \$30 a month and give
their lives as well.

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Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
 Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
 President—G. H. Stickney.
 Secretary—Clarence L. Law.
 Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
 Secretary—E. M. Haggerson, Silver City, N. M.
 Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—H. C. Morris.
 Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
 1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
 Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
 Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
 Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
 Secretary—W. C. McWhinney, Southern California Edison Co.
 Meetings—Every Wednesday, 12 m., at the American Cafe.

San Francisco Electrical Development League

President—R. E. Fisher
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
 Secretary—A. E. Coney, Great Western Power Company, San Francisco.
 Meetings—About every 50 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric Company, Oakland, Cal.
 Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club

Secretary—C. A. Blair, Los Angeles.
 March 22d—S. J. Keese—"Light and Color Waves."

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section

President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
 Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.
 March 21st—H. C. Blote—"Experiences with the Allied Armies in France."

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
 Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
 Meetings—Quarterly.
 Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
 Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
 Meetings—Quarterly.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—Orrin E. Stanley, Box 973, Portland, Ore.
 Secretary—C. J. Hogue, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.
 March 21st—E. B. Thompson—"The Oregon City Locks."

The Engineers' Club of Seattle

President—J. F. Pinson, Seattle, Wash.
 Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
 Meetings—Thursday noon at the club

rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.

President—B. P. Legare, 58 Sutter St., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.
 Annual meeting: October.
 March 22d—Jerome Landfield—"Russian Conditions."

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
 Secretary—Ira F. Shaffner, Boise.
 Annual meeting: January.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS**American Ass'n for the Advancement of Science—Pacific Division**

President—D. T. MacDougall, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
 Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
 Meetings—Annual.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
 March 27th—Deva Ram Sokul—"Trade Opportunities in India."

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
 Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
 Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

New Business

The Seattle office of the United States Rubber Company—Wire Division—524 First avenue South, Seattle, is supplying the Pacific States Electric Company with \$15,000 worth of wire for use in 20 wooden ships under construction in the Sloan Shipyards at Olympia, Washington. Clarence P. Deming is Northwest manager of the Wire Division, United States Rubber Company.

The contract for furnishing transformers to the city light department of Seattle, Wash., has been awarded to W. R. Hendry & Co., for \$55,778.94.

The Western States Gas & Electric Company has secured five-year renewal contract covering the electrical requirements of the Pacific Sanitary Manufacturing Company of Richmond, Cal.

NePage, McKenny Company, electrical engineers and contractors, Armour Building, Seattle, are engaged in constructing a transmission line from Bremerton to Keyport, Washington, for the Bureau of Yards and Docks, same to cost about \$9000. They are also doing the complete electrical work in the Bradner Apartments, aside from a large amount of work for the Emergency Fleet Corporation.

The firm of Cutting & Washington, Cambridge, Mass., representatives of radio and wireless apparatus, have installed at the offices of A. H. Cox & Company, 307 First avenue South, Seattle, a demonstration plant, and in some recent

tests made by inspectors of the government, this proved highly proficient. There is no buzzing in the receivers and dangerous high voltage current is eliminated on the secondary side and it is possible to handle any part of the apparatus while it is in operation.

The A. G. Manufacturing Company, 1350 Dearborn street, makers of switchboards, stage lighting, and other equipment, has just completed manufacture of the equipment for the Marlowe Theatre at Helena, Mont., including switchboards, panel boards, border lights, footlights, stage plugs, receptacles and dimmers. The company is also doing much marine work including outlet boxes and telltale or running light indicators. The main lines, however, are switchboards, knife switches, steel boxes and specialties, having the only knife switch plant on the Pacific Coast.

A. H. Cox & Company, 307 First avenue South, Seattle, has finished installation of six cranes for the Queen City Machine Works, which have a closed circuit automatic switch attachment and other features, making them different from

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any other kind. Manager Edwards of the Queen City Machine Works prepared the design for these cranes. The company has also completed installation of the electrical equipment on a ten-ton marine elevator at the Oregon-Washington Dock which will be operated by a variable speed 25 horsepower Allis-Chalmers motor.

New Power Loads

An additional section of switchboard has recently been added to the private branch exchange in the Hotel Tacoma at Tacoma, providing a two-section switchboard. The hotel company has just equipped a building located across the street from the main hotel to be used as an annex, and ninety-five telephone stations have been installed in the new rooms.

As a result of the intense activity in shipbuilding industry at Eureka, Cal., the Western States Gas & Electric Company has accepted a large amount of additional power business recently. The Hammond Company has abandoned operation of its private power plant, which operates a saw-mill during the day, and will purchase current from the Eureka division. The Rolph Company is doubling its electric power requirements and the new shipyard to be established in the city will require 400 horsepower.

The National Ice and Cold Storage Company is installing 180 horsepower in motors which will be served by the Western States Gas & Electric Company, Stockton division. This installation displaces a steam power plant formerly operated by the ice company, making a total electric load of 230 horsepower, energy for which is furnished by the Stockton company.

The Columbia Steel Company, Pittsburg, Cal., is building an addition to its main foundry and a building in which will be placed two 30-ton and one 10-ton traveling cranes. A new 15-ton locomotive crane will also be added—all served by the Pacific Gas and Electric Company. The output of the plant will be increased 60 to 70 per cent.

Changes and Beginnings

The Hallidie Company of Spokane, of which the U. S. Iron Works, Seattle, is a subsidiary concern, has purchased the Sammis Monumental Works in Spokane and is moving its plant to that point from Railroad avenue and Wall street. About \$75,000 worth of new machinery is being installed. Among other work being turned out by the company are four 2500 horsepower steam turbines for Coughlin & Sons Shipyards at Vancouver, B. C., and ten similar turbines for the United States government.

The Jaggar-Sroufe Company of Portland, Ore., have opened up their new office at 103 West Park street.

On March 4, 1918, the offices of the New York Distributing House of the Western Electric Company, Inc., moved to 151 Fifth avenue, New York City. Their previous location was at 463 West street, New York City. The building at this address will be devoted to the activities of the engineering department.

In connection with the transfer of the general office of the Hotpoint Division of the Edison Electric Appliance Company from Ontario to Chicago, the company has also transferred its contract department. On and after April 1st, therefore, all communications in connection with contract work for the Hotpoint Division should be addressed to the general office of the Hotpoint Division, 5660 West Taylor street, Chicago.

The Westinghouse Electric and Manufacturing Company has leased for a period of years the Baxter Stove Company, Mansfield, Ohio, with the intention of consolidating at this plant the manufacture of its heating appliances now being

carried on at some of the other Westinghouse plants.

The McFarland Telephone Company has recently been incorporated in Kern county, Cal.

The Round Lake Irrigation Company was incorporated March 3d, in Seattle, Wash.

Florence, Ore., has a new telephone company, which was incorporated March 2d, under the name of the North Fork Co-op. Telephone Company.

J. D. Barnhill, Inc., announce a change in name to Dodd-DuBosque Company, Inc., with offices as before, at 110 West Thirty-fourth street, New York.

Issue of Power Bonds

The Railroad Commission recently issued an order authorizing the San Joaquin Light & Power Corporation to issue \$767,000 6 per cent first and refunding bonds, payable in 1950, to be sold at not less than 90 per cent of face value, and the proceeds to be deposited in a special fund to be expended hereafter on the orders of the commission. The money is needed, the company says, to buy property, construct, expand and improve its facilities and service, and is to be spent from time to time as the liabilities are incurred. The company, instead of issuing bonds to provide funds for paying for 85 per cent of the cost of additions and betterments, has adopted a policy of providing for but 75 per cent of these expenditures by bonds. In general, its 1918 electric construction program calls for the installation of a hydro-electric plant at its Crane Valley dam, a plant also at its No. 1 reservoir, and the building of a six-inch natural gas transmission line to connect its Bakersfield steam generating plant with the Midway Gas Company's natural gas line from Midway Oil fields to Los Angeles. Also, preliminary work on its new proposed hydro-electric plants on the San Joaquin River and the North Fork of the Kings River, the completion of transmission lines, substations, and the construction of distribution lines to take care of new business.

Good Showing for Power Company

Pacific Power & Light Company, Portland, made a good showing of net earnings for January, also for the year 1917. The net for January was 33 per cent and the gross revenues increased 17 per cent over the same month of last year. For the twelve months the net earnings were greater by 22 per cent, operating expenses by 3 per cent, and the gross earnings 13 per cent higher than the corresponding period of 1916. The following figures show the exact status of the company affairs:

	Jan., 1918	12 Months
Gross revenue	\$153,062	\$1,166,775
Operating expense	71,783	785,864
Net earnings	\$ 81,279	\$ 883,909
Balance after deducting all fixed charges....	\$ 45,081	\$ 447,045

Calaveras Dam Goes Out

Work on San Francisco's new water supply in Calaveras Valley was delayed a year, half a million dollars damage was done, and the surrounding country escaped devastation by a seeming miracle, between 6 and 7 o'clock on Sunday morning, March 24, 1918, when the Calaveras dam, a \$2,500,000 construction work seven miles back of Milpitas, went out. The slide was caused by the weight of the clay which is being used to ballast the center of the dam.

A rumble which startled the 200 workmen quartered at the dam was the only warning of the impending disaster. Men rushed from the bunkhouses in time to see 600,000 cubic yards of earth slide into the reservoir and smash against the 210-foot concrete tower which housed the flood gate machinery, tearing the tower from its base and plunging it into the water. The fall of the earth blocked the water tunnel under the dam and prevented the 60 feet of water in the reservoir rushing down onto the country about Sunol.

The dam has been under construction for two years, and would have been finished next year. It will be the largest dirt dam in the world, and was 80 feet thick a quarter of a mile across the canyon, and nearly 100 feet in height. The building of this great structure was described, illustrated in full, in the Journal of Electricity, February 15, 1917.



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LATEST IN EVERYTHING ELECTRICAL

(The recent featuring of accidents occasioned by poor installations in laundry rooms and other damp places lends interest to the pull chain socket here presented which is specially designed to insure complete insulation. A special safety switch which can be handled with impunity by persons not skilled in electricity, a series of porcelain receptacles, and a new use for lifting magnets, are further included among the new devices.—The Editor.)

Recovering Sunken Treasure

The Arrow Transportation Company, operating a line of barges on several of the southern rivers, lost one of its barges in the Tennessee River near Paducah, last March. This barge, loaded with about 420 tons of sand-cast pig-iron, collided with the pier in the river and the barge began listing, dropping its load gradually, and, therefore, strewing the pig-iron along the bed of the river for a distance of 100 feet or more.



Lifting magnet disappearing below the surface in seeking its load of pig-iron which has been lost through sinking of a 400 ton cargo.

The loss represented about \$10,000, and the insurance company paid over this amount to the transportation company. The insurance company later made arrangements to recover what they could of the cargo by means of a barge and a C-H lifting magnet, purchased from the Cutler-Hammer Mfg. Co., of Milwaukee, Wis. By letting the magnet down to the



Magnet clear of the water after having picked up a load of pig-iron from the bottom of the river

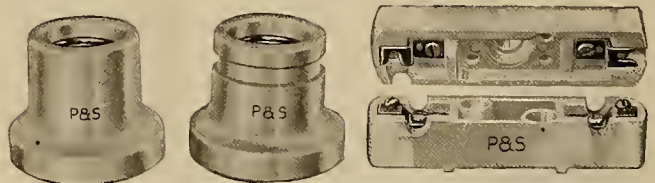
bed and dragging it along in the vicinity in which the material had sunk, over 90 per cent, or approximately 400 of the 420 tons were recovered.

The cargo was not only saved, but, because of the rising cost of pig-iron it was sold for \$16,000, while the total cost of recovering, including the rental of barges and the purchase of a magnet, amounted only to \$4000, which gave the insurance company approximately \$2000 plus a lifting magnet, which has since been put to use in salvaging other lost cargoes. The magnet used was 43 inches in diameter, and of the standard C-H type, which is waterproof.

Porcelain Concealed Receptacles

P. & S. 4000 and 4001 are new P. & S. porcelain concealed receptacles. The wires are introduced from the back of these receptacles. The outer porcelain shell entirely conceals the supporting screws as well as the binding screws and terminals. P. & S. 4000 is shown without the shade-holder groove, and P. & S. 4001 with the shade-holder groove. The outside diameter of the base of these receptacles is 2 5/16 inches.

P. & S. 565, a cleat rosette of special, rugged construction, is designed to carry the wires a full half-inch from the



P. & S. 4000

P. & S. 4001

P. & S. 565

P. & S. Specialties

surface wired over. The terminals are arranged to separate the wires by a space of 2 1/2 inches, and the binding screws which secure the cap to the base are so arranged that the cap may be pivoted on one end while the other end of the cap, when the binding screws are released, swings in or out of position and is thereby made easy to wire on a step-ladder or at the bench.

Ample wiring room will be found in the base and provision is made in the cap for a practical knot in the drop-cord to relieve the strain on the terminals.

Small Motor Switches

Below are shown illustrations of two switch condulets of the ZY series—the latest additions to the large family of conduit fittings manufactured by the Crouse-Hinds Company of Syracuse, N. Y. As safety-first fittings, it is claimed for them that they protect the switch operator and the person renewing fuses from shock; they cannot be operated by accident; they withstand the roughest usage; water will not drain into them, and it is impossible for lint or other inflammable particles to lodge upon the current-carrying parts, and thus create a fire hazard.

Both the body of the condulet and its cover are cast iron. Inside is a combined 20-ampere snap switch and fuse block. The switch is externally operated, and its handle interlocks

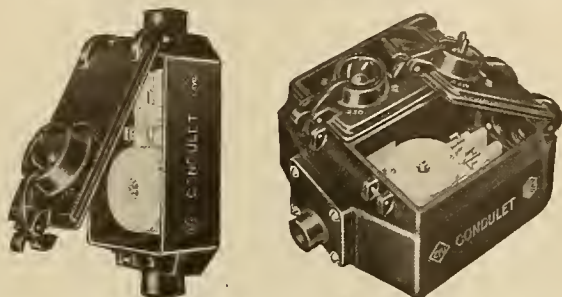
The average American has a better opportunity in life than the average German. Why?

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with the latch of the door in such a way that the latter cannot be opened when the switch is in the "on" position. As a result of this arrangement, the circuit is dead when the door is open, and fuses can be replaced without danger of shock or short circuit.

As the machine operator or any other person not skilled in electricity can change fuses with perfect safety in ZY condulets, their use prevents all the loss in productive time which



Type ZYC on the left (one-gang, through feed). Type ZYU on the right (two-gang, through feed, one-main, two branch hubs)

is unavoidable where an electrician must be sent for to replace fuses.

The manufacturers list ZY condulets in one and two-gang forms and in sizes and arrangements of threaded conduit hubs to meet various conduit wiring arrangements.

The New Benco Pull Chain Socket

The Benco Pull Chain Socket has been in process of building for several years. This socket has been on the market for a while, but, nevertheless, has remained in its experimental stage until the present time.



The pull member differentiates from the other, in that it is vertical and direct in action. The chain passes down inside the socket, completely insulated from live parts of the device which are molded in an insulating composition. Recently, this socket was subjected to the severe test given to devices of this kind by the Underwriters' Laboratories, and approved for use in damp places on account of the high insulation and the good protection from moisture.

The shell in the weatherproof form of this socket is made in either aluminum or copper; the asbestos composition base of the molded parts is non-absorbative, so that there is no possibility of the molded portions becoming conductors from the live parts to the pull member. The composition of the molded parts will stand a considerably higher temperature than the socket will reasonably ever have.

These sockets are provided with a special lamp grip feature which prevents lamps from falling. The device is approved for a rating of 660 watts, 250 volts, and the operating mechanism is of a quick make and break type.

The threaded portion at the base of the shell is designed to receive all of the Benjamin type "S" fixture connectors and reflectors.

Electrical Heating Publication

An article, "Electrically Heated Japanning Ovens," by C. F. Hirschfield, reprinted from the N. E. L. A. Bulletin, and "Heat Calculation for Baking and Drying Ovens," by W. S. Scott, reprinted from the Electrical Journal, have just been issued in bulletin form by the Westinghouse Electric & Manufacturing Company. This publication should be of much value to central station solicitors who are endeavoring to interest

their customers in the electrical heating of ovens, as well as to present and prospective users of such equipment.

GOVERNMENT OPPORTUNITIES

New Opportunities in the Ordnance Service

So pressing has become the need for persons to serve in the Ordnance Department as mechanical draftsmen and mechanical engineers, that the Acting Chief of Ordnance has suggested that the American Society of Mechanical Engineers assist in meeting this demand.

As indicated by the civil service announcements, there is a very urgent need for other employees. Particular stress is being placed at the present time on the positions of mechanical draftsman and inspector of munitions.

Mechanical draftsmen should meet the requirements outlined in announcement No. 242. Almost any man with mechanical drafting experience can be utilized in some position in the Ordnance Department. There are no openings, however, for architectural and structural draftsmen.

Mechanical engineers with certain qualifications are employed in the Ordnance Department as inspectors. The demand for men of this training is practically unlimited, and any number can be employed to advantage. They are an important part of the ordnance organization. They inspect the munitions that are to be sent to our soldiers in France, and upon this inspection depends the character of war material which is supplied to our troops. The demand for men in this branch of the service is increasing each day, and will continue to grow.

The names of any engineers who are qualified to fill any of the positions mentioned, and who would be willing to serve in the Ordnance Department, should be sent at once to L. H. Van Dusen, Major, Ordnance, N. A., Washington, D. C., and detailed information will be sent by return mail.

Draftsmen Wanted

There is wanted in the office of the Department Engineer, Santa Fe Building, San Francisco, a number of topographic draftsmen for work in connection with military mapping. An opportunity is presented those who desire to do their bit and who are qualified for this work. Salaries range from \$90 to \$125 per month, depending upon ability. Those who prove proficient can have employment as long as available funds permit.

Women in Ordnance Department

According to a call just received by the Military Bureau of the University of California, there is an urgent need for women to serve in the Industrial Service section of the Ordnance Department. Accepted candidates will be assigned as supervisors to district offices of the department. Candidates should possess special experience in dealing with labor problems in manufacturing establishments. Certain types of industrial investigation or experience in employment management departments are illustrative of the work which is considered most useful in meeting the requirements.

As acting supervisors in district offices of the Ordnance Department, these women will be responsible for keeping the department informed of conditions of labor in plants in their district with a view to making constructive suggestions from problems arising in war industries.

War Training Course for Electricians

A war training course for electricians and telephone men needed for the United States Army has just been published by the Federal Board for Vocational Education. This course, it is planned, will be given to drafted men, enlisted and detailed on subsistence and pay to schools co-operating with the Federal Government in the preparation of mechanics and technicians for military service. The course consists of 36 lectures and four classroom, field and shop units on electric wiring, testing, motors and generators, and telephone work. The instruction book is known as Bulletin No. 9, and may be had free on application to the Federal Board of Vocational Education, Ouray Building, Washington, D. C.



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NEW ELECTRICAL DEVELOPMENTS

(Interest in the Northwest centers in the development of the plans of Seattle and Portland for municipal projects. The Pacific Power & Light Company is installing further improvements, and in Oregon the largest milling and smelting plant of this region has been contracted for, which will act as a load builder in the near future. The skip-stop system for electric railways is being adopted as an electricity economy measure in the bay region. In the Southwest, the municipal rivalry in Los Angeles is again to the fore, and there are numerous applications for water for power developments in this and the Inter-Mountain Districts.—The Editor.)

THE PACIFIC NORTHWEST

KASLO, B. C.—The question of establishing a 24-hour service in connection with the municipal electric-light plant is under consideration. Fred D. Emory is chief engineer.

KELSO, WASH.—The district office of the North Coast Power Company, formerly at Kalama, will be transferred to Kelso. F. A. Peterson will assume the management of the Kalama office.

VANCOUVER, WASH.—The Portland Railway, Light & Power Company contemplates an extension of its 11,000-volt commercial feeder line to pick up 2000 horsepower steel ship-building load. F. H. Gray is division manager.

SEATTLE, WASH.—The lighting department of the City of Seattle has secured a contract to supply 2500 horsepower to the shipyards of the Erickson Engineering Company. This company will construct steel ships.

SEATTLE, WASH.—C. H. E. Williams, electrical engineer with offices in Seattle and Vancouver, B. C., has secured the contract for wiring the ten 9400-ton steel ships now under construction by the Erickson Shipbuilding Company at this place.

WALLA WALLA, WASH.—Further improvements are contemplated by the Pacific Power & Light Company to its local system. The company is building a new switching station at Pasco, which, when completed will improve the service in Walla Walla.

SEATTLE, WASH.—Pacific States Electric Company, 570 First avenue South, Seattle, has secured the contract for supplying all the electrical supplies for use in the 20 3500-ton Ferris type wooden boats which the Sloan Shipyards Corporation is building at Olympia, Wash.

PORTLAND, ORE.—Bids will be received by the Commission of Public Docks up to April 9, 1918, for building an \$800,000 or \$900,000 elevator, including transformer house, etc. Certified check for 5 per cent of bid, on bank with capital of at least \$100,000, is required with bid.

SNOHOMISH, WASH.—Mayor J. W. Hall has publicly announced that he is in favor of a movement to utilize water power of the county for municipal electric-light plants, asserting that Snohomish can obtain 5000 horsepower from the dam of the city gravity pipe line. The Commercial Club is also back of the project.

PORTLAND, ORE.—An ordinance was introduced recently in the city council, which, if passed, will put up to the vote of the people at the city election on April 16th, the question of voting \$4,000,000 in bonds for the purchase of a new power site and the erection thereon of a new power plant for additional electrical power.

PORTLAND, ORE.—What may become the first unit of a municipal power plant is now under construction by the water bureau at the headworks of the Bull Run water system. Plans have been prepared for the installation of a 4-kw. electric plant for lighting the buildings at the headworks. L. M. Kaiser, superintendent of the water bureau, has charge of the work.

PORTLAND, ORE.—The Pacific Power & Light Company, Portland, is raising the sum of \$500,000 for capital requirements to meet demands for more power in the territory.

GARDINER, ORE.—Steps have been taken by Warren Reed of Gardiner and James R. Wheeler and Arthur Blau-

chard of Marshfield to organize a new electric company to be known as the Umpqua Power Company. The new company will take over the property of the Gardiner Light & Power Company and will furnish electrical service in this city and Reedsport, now without service.

TACOMA, WASH.—Council has decided to place on ballot at the coming election a proposition to acquire the street car system of the Tacoma Railway & Power Company for a sum not to exceed \$5,200,000. The aggregate is composed of \$4,500,000 for purchase of system, \$300,000 for refunding the present tide flats line, and \$400,000 to make repairs on streets and the rehabilitation of the plant of the company.

SEATTLE, WASH.—The Board of Public Works has been authorized by ordinance to prepare plans and specifications for the immediate construction of the new elevated municipal railway on Whatcom and Spokane avenue, for which \$350,000 in bonds was voted on March 5th. Pending the sale of the bonds, \$50,000 is to be borrowed from the general fund to aid in this construction, ordinance for such loan having been passed and approved by the mayor.

GRANTS PASS, ORE.—A contract has been awarded for the installation of a large ore-reduction plant for the Alameda Mines Company on Rogue River, 27 miles below Grants Pass. This is to be the largest milling and smelting plant in Oregon and one of the largest on the coast, with a daily capacity of 400 tons. The contract calls for the installation and equipment of an ore-concentrating mill of not less than 200 tons daily capacity, including power machinery for operation of the entire plant. The contract price to be paid for the plant is \$200,000.

SEATTLE, WASH.—Following bids were received for power plant to be supplied to the city, Grant, Smith & Company, a local concern, bidding on three propositions:

Proposition A—Plant on the Skagit River, all permanent construction, with ultimate capacity of 420,000 kilowatts; \$4,297,000.

Proposition B—Plant on Skagit River, largely timber construction, \$2,381,000.

Proposition C—Plant on Skykomish River near Gold Bar, permanent construction; \$3,556,000.

The Puget Sound Bridge and Dredging Company, Central Building, submitted bid for construction of a plant on the Stillaguamish River with a capacity of 36,000 kilowatts, delivered, all permanent construction, at \$4,200,000.

Packwood Lake Construction Company submitted two bids for a complete power plant on Packwood Lake, \$4,031,000 for high tension switching outside, and \$4,121,000 for a complete power plant with switching inside. These bids did not include transmission lines. According to the estimate of City Engineer Arthur J. Dimock, a steel tower double line transmission from the Skagit River to Seattle would cost about \$1,200,000, and from the Skykomish site about \$500,000.

If you hadn't lived here you might
not have made that money.

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PACIFIC CENTRAL DISTRICT

OAKLAND, CAL.—All wires in the Lake District between Wesley avenue and Cottage street, are being placed underground.

FRESNO, CAL.—The Copper Mine substation of the San Joaquin Light & Power Company was recently destroyed by fire, causing a loss of about \$3000.

SAN FRANCISCO, CAL.—Extension of the Municipal Railway beyond the Twin Peaks tunnel was decided upon at a conference in the mayor's office.

NAPA, CAL.—The Pacific Gas & Electric Company having asked for a franchise for power purposes in this city, a resolution of intention calling for bids was adopted by the council.

SAN FRANCISCO, CAL.—Sealed bids will be received at the office of the board of public works, April 10th, for furnishing railway signal material for the Twin Peaks tunnel line, Municipal Railway System.

PACIFIC GROVE, CAL.—There is now a bright prospect of the immediate improvement of the tracks and equipment of the Monterey and Pacific Grove Railway, and an ultimate surety of new rail and rolling stock.

REDDING, CAL.—The city trustees have passed an ordinance authorizing the submission to the electors of a bond issue of \$40,000. This has to do with the extension of city lights into the homes and business places of the town.

SAN FRANCISCO, CAL.—Directors of the Northwestern Electric Company have declared regular quarterly dividend No. 12 of \$1.50 per share on the preferred stock, payable April 1 to stock of record at the close of business March 3.

ALTURAS, CAL.—The special election held in the north end of Surprise Valley to determine whether an irrigation district should be formed for the purpose of tapping Cow Head Lake in that valley and irrigating about 17,000 acres of land, was overwhelmingly carried.

AUBURN, CAL.—The new electric power plants—Halsey at Clipper Gap and Wise at Auburn—are closed and there is a washout in the Hotchkiss orchard at Applegate, as the result of a tunnel cave-in on the new canal of the Pacific Gas & Electric Company on the Hotchkiss property.

OAKLAND, CAL.—The American Dredging Company is about to start an eight months job along the Alameda estuary. Electric power will be utilized to operate the "American" dredger. A pole line will be extended along the water front supplying the electric power, to which will be extended a submarine cable.

FRESNO, CAL.—San Joaquin Light & Power Corporation has filed with the Railroad Commission an application for authority to issue \$1,000,000 of its 6 per cent first and refunding mortgage bonds. The proceeds from the bond sale are to be used to complete additional facilities upon which work has already started.

SAN FRANCISCO, CAL.—The skip-stop plan of operating street cars in the East Bay cities will be inaugurated on April 1 by the San Francisco-Oakland Terminal Railways. The scheme of having fewer stops for street cars is advocated as a means of saving fuel and for shortening the trip between Oakland, Alameda and Berkeley.

KNIGHTS FERRY, CAL.—Plans are being considered to reopen the old power plant at Knights Ferry, which was closed down over 12 years ago. The Railroad Commission has asked that this plant be used, as it will be a means of conserving oil. The plant is owned by the Sierra and San Francisco Power Company. H. F. Jackson, 58 Sutter street, San Francisco, is general manager.

WILLOWS, CAL.—A proposition is on foot to lease pumps and motors for this year and install them at Sidds Landing and have them furnish water for the River canal and also for irrigating a large tract of rice land. It is understood that these pumps and motors are now being negotiated for by Chas. L. Donohoe, who is interested in much of the land that has been denied water by the Railroad Commission.

SAN FRANCISCO, CAL.—Plans for a union railroad depot for San Francisco on Mission street, between Eleventh and Twelfth, were outlined in an address by M. J. Lyon to the city planning committee of the Commonwealth Club. The plan includes the extension of Van Ness avenue to Mission street and an elevated electric road from the second story of the ferry building along Minna street to the second floor of the proposed union station, and then along McCoppin street with a surface line to connect with the Twin Peaks tunnel line.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Contracts for additional lights in the Graham Lighting District have been awarded by the supervisors to Southern California Electric Company.

LOS ANGELES, CAL.—Sealed bids will be received by the board of supervisors up to April 18th, for moving and erecting power house equipment in the new power house at the county hospital.

PASADENA, CAL.—The city purchasing agent has been authorized to purchase without contract, lamps, solid tires, electrical supplies and wire for the light department.

BOWIE, ARIZ.—The Southern Pacific Company has appropriated \$20,000 for remodeling its depot in Bowie, and is also contemplating the installation of a power plant here.

DEMING, N. M.—A project that is being agitated here is the establishment of a power plant at Elephant Butte dam to furnish power for the pumping plants in Mimbres Valley.

LA HABRA, CAL.—Plan fathered by La Habra Mining & Milling Company to secure lights for the town is approaching completion and is meeting with approval of citizens and merchants.

WHITTIER, CAL.—City clerk has been instructed to advertise for bids on electric motors for use in the city's pumping plant under specifications provided by the water superintendent.

DEMING, N. M.—Extensions and improvements involving an expenditure of at least \$300,000 will be made at Camp Cody, Deming. The proposed work will include another electric power plant of 185 horsepower.

SANTA FE, N. M.—The voters of Des Moines, N. M., will pass on the question of whether or not that town issues \$50,000 worth of bonds for the purpose of purchasing and improving the present water and light plant.

EL CENTRO, CAL.—Construction of a new power line from Hanlon heading to a point on the Alamo where dredges are being operated has been ordered by directors of Imperial Irrigation District. The power line is to cost \$11,000.

RIVERSIDE, CAL.—The Southern Sierras Power Company has announced that approximately \$279,000 will be expended in the reconstruction of one of its main transmission lines, extending for a distance of 60 miles from its hydro-electric plant located on Rush Creek in the Sierra Nevada range.

ORANGE, CAL.—The first step toward installing a street lighting system in this city was taken by the city council when instructions were given to the city attorney to draw up a resolution of intention for that improvement. Specifications under consideration by the council provide for a handsome system of concrete posts of the single light type.

BISHOP, CAL.—A mill will be built at the camp at the Pine Creek tungsten claims, recently secured by the Cooper Shapely of the Round Valley Tungsten Company. Two Marcy mills with a combined capacity of 150 tons daily will be installed. Arrangements, it is understood, have been made with



Better than charity is support.

BUY A LIBERTY BOND

the Southern Sierras Power Company for furnishing electricity to operate the proposed mills. To furnish the service a transmission line 12 miles long will be erected.

SAN DIEGO, CAL.—The common council is offering for sale to the highest bidder, a franchise to construct, maintain and operate a street railway. Sealed bids will be received up to April 15th.

RIVERSIDE, CAL.—The Southern Sierras Power Company has petitioned the State Railroad Commission for permission to purchase and incorporate under its management the Corona (Cal.) Gas & Electric Company, the Rialto (Cal.) Light & Power Company, and the Bishop (Cal.) Light & Power Company.

LOS ANGELES, CAL.—An additional hydro-electric unit capable of developing 20,000 horsepower, which is now going to waste, will be built in the near future by the Los Angeles municipal government, at a cost of \$1,400,000, and placed in active competition with the private gas and electric companies, according to the mayor of Los Angeles.

YUMA, ARIZ.—The Imperial Oil Mills has filed an application for a franchise to construct and operate electric light and power lines along, over and across all public highways in Yuma Valley, Ariz. It is the intention of the board of supervisors, at a meeting on April 22, 1918, to grant the application. Construction of the system will be commenced within 60 days and it will be in operation within one year from and after the granting of the proposed franchise.

RIVERSIDE COUNTY—Geo. L. Lamy of Los Angeles has made application to the State Water Commission for 50 cubic feet per second of Lake Elsinore, tributary to the San Jacinto River in Riverside county, for power purposes. The proposed works contemplate an open cut and cement pipe with a concrete headgate in the lake, and canal and a pipe line 35 miles in length. By a drop of 8 feet it is proposed to develop 3300 theoretical horsepower. Cost of project is placed at \$300,000.

LOS ANGELES, CAL.—Twenty private power lines crossing tide lands under the control of the Harbor Commission will be cut down to prevent competition with municipal power, unless the private corporations retire from the field, according to the decision of the Harbor Commission. This commission, having determined that industries at the harbor will be supplied with municipal power, have decided to refuse permits for electric lines crossing tide lands under its control.

THE INTER-MOUNTAIN DISTRICT

WHEATLAND, WYO.—Bonds have recently been voted for the installation of a municipal electric-light plant in Wheatland.

COLORADO SPRINGS, COLO.—Colorado Springs Light, Heat & Power Company seeks a 10 per cent increase in its rates in residential lighting.

SALT LAKE, UTAH—At a meeting of the directors of the Pope-Shonon mine, it was voted to install electric power and machinery at the earliest possible date.

BONNERS FERRY, IDAHO—John E. Price & Company of Seattle, Wash., have taken an option on the holdings of the Bonner Water & Light Company of Bonners Ferry, the price being placed at \$135,000.

BRIGHAM, UTAH—The electric light committee is contemplating removing the lamp poles from the center of the street to the curb line in the business section of the city. C. O. Roskelly is manager of the municipal electric-light plant.

BEAVER CITY, UTAH—The State Industrial Commission of Utah has ordered the purchase of \$2000 of Beaver City electric light bonds, bearing 5½ per cent interest, due in 1937. The purchase is still subject to the action of the state board of examiners.

GREAT FALLS, MONT.—Work will be started immediately by the Anaconda Copper Mining Company on the con-

struction of a plant at the Boston & Montana works at Great Falls for the electrolytic production of ferro-manganese. Five furnaces will be installed, each with a daily capacity of 250 tons. Electric power will be supplied by the Montana Power Company.

NAMPA, IDAHO—At a recent meeting of the city council, the mayor was authorized to enter into a contract with the Idaho Power Company for the placing of 100 incandescent street lights to take the place of 61 arc lights that now represent all the city lights.

SALT LAKE CITY, UTAH—Hinckley-Deseret, Hinckley-Oasis and Abraham are to have electric lights. The Deseret Irrigation Company closed a contract with an eastern concern for the installation of a 100 horsepower lighting plant with 15 miles of transmission lines.

CASPAR, WYO.—The Natrona County Electric Company and the Wyoming Electric Company, both of Caspar, have been consolidated under the name of the Natrona Power Company. The concern is capitalized at \$1,000,000 and furnishes electricity to the Casper district.

SALT LAKE, UTAH—Intending to build a hydro-electric plant to develop 350 horsepower, Charles B. Bartlett of Vernal has filed application with the state engineer for use of 40 second cubic feet of water from Whiterocks Creek, Uintah county. He intends to market the resultant power in Lapoint and that vicinity.

TOOELE, UTAH—The Utah Lime & Stone Company is negotiating with the Clark Electric Power Company of Tooele to extend its electric transmission lines to Flux and Dolomite to furnish electricity to operate its factories at those places. The lines of the Clark company now extend within seven miles of the property of the Utah Lime & Stone company.

YERINGTON, NEV.—Application has been made to the State Water Commission by A. M. Wishart, Alexander Cameron and James Herrin of Yerington to impound 20 second feet of the waters of Sweetwater Creek in Mono county. They propose to build a dam 10 feet high and 48 feet long, and running from the pool so formed is to be a metallic flume three and one-half miles long. It is estimated that 2575 horsepower will be developed.

BOISE, IDAHO—The question of signing a five-year lighting contract for the city street lights in the residence section was discussed at a meeting of the city council. The old contract has expired, and by adopting a newer light system the city can save \$3000 a year. The public utilities will not permit of less than a five-year contract. The contract is to call for the installation of 100 new lights.

COTTONWOOD, IDAHO—At a mass meeting held in Keuterville last week, a new telephone company was organized in order to provide adequate telephone facilities to serve that community. It is estimated that the new line will cost about \$4000, of which \$3200 is already subscribed. A permanent organization was effected at the meeting, and trustees were elected with instructions to proceed at once with the construction of the line.

SALT LAKE, UTAH—G. R. Coroy of Salt Lake has filed an application with the state engineer for permission to use 125 second feet of water from the Price River to develop 1600 electrical horsepower. The proposed plant would be within a few miles of Helpe and would involve the construction of a concrete dam three feet high and forty feet long, the water to be conducted in a ditch for a distance of a mile and a half, and through two four-foot wheels.

Think—if we should fail?

BUY A LIBERTY BOND



Ad-itorial Comment

(Service to the electrical dealer is the keynote of the advertising in this issue. The man who sells electrical devices will find valuable information herein. Thus he is prepared to meet the demand which is being created by means of popular advertising. But as the copy and medium which creates the demand are seldom adapted to help the dealer anticipate it, the wise advertiser complements his popular advertising by well-timed announcements in the trade and technical press.—The Aditor.)

Crocker-Wheeler Co. tells of the dependability of C-W motors for all services.

Faries Manufacturing Co. advertises patented parts for making up lighting fixtures.

Hurley Machine Co. reiterates the importance of Thor washers as labor savers in war times.

Sprague Electric Works suggests the use of BX cable and accessories as a means for minimizing fire hazard.

Wagner Electric Manufacturing Co. advertises that it can supply a motor to care for any service on A. C. lines.

Moloney Electric Co. exemplifies its product by showing a Western installation of 60,000 volt transformers.

Pacific States Electric Co. gives prominence to the manufacturers for whom it acts as distributors on the Pacific Coast.

Weston Electrical Instrument Co. invites investigation of the superiority of its indicating instruments for electrical measurement.

Hubbard & Company's transmission line specialties and pole-line hardware "trouble-proof" the line by eliminating the weak points.

Condit Electrical Manufacturing Co. has issued seven bulletins illustrating and describing the use of electrical protective devices.

Allis-Chalmers Manufacturing Co. shows the two 23,000 horsepower Big Creek units as the most powerful impulse wheels in the world.

Hotpoint Division, Edison Electric Appliance Co., details its advertising in popular magazines as an incentive for retailers to profit by tying in therewith.

The Electric Storage Battery Co. has been making storage batteries for thirty years, and their batteries are now employed for nearly every large use.

The Union Metal Manufacturing Co. impresses on planners of city lighting the superiority of Union metal lamp standards for modern white way lighting.

The American Conduit Manufacturing Co. offers the contractor an opportunity to participate in the results of its big spring drive to popularize Wiremold.

Westinghouse Electric & Manufacturing Co. illustrates and describes the 49 panel switchboard installed for the new Pittsburgh municipal and county building. A striking indication of thirty years' progress in A. C. generator construction is presented by a picture of a 70,000 kw. turbo-generator set compared with a machine advertised in 1887. The Type OA watthour meter is also presented as the culmination of three decades of meter progress.

The R. Thomas & Sons Co. shows various types of insulators for use in overhead line construction.

Western Electric Co. features three types of electric washing machines, backed by its sales service.

The Robbins & Myers Co. demonstrates the strength and rigidity of Robbins & Myers fan motors.

Ward Leonard Electric Co. gives emphasis to a hardy resistance unit designed to be slipped into a fuse block.

National Lamp Works lays stress upon the high quality of National Mazda lamps, and upon sales help accorded.

Baker-Joslyn Co. brings out the advantages of using Joslyn hot galvanized pole line hardware for line construction.

Standard Underground Cable Co. advises of its facilities for delivering the highest quality electric wires and cables.

V. V. Fittings Co. is doing its bit in supplying vapor-proof fittings and safety devices for building the new merchant marine.

Century Electric Co. features quiet operation as another one of the permanent characteristics which distinguish Century motors.

L. Plaut & Co. reproduces an advertisement of the Four-in-one Light which is being given a nationwide popular circulation.

The Locke Insulator Manufacturing Co. has appointed the Pacific States Electric Co. as exclusive sales agent in the Western States.

American Electrical Heater Co. attractively displays "American Beauty" heating devices as a means for building up a permanently successful business.

Ivanhoe-Regent Lamp Works calls attention to the Ivanhoe Reflecto-Cap Diffuser, a new lighting unit which permits night work on former day processes.

Garland & Affolter Engineering Co. features Peerless Fans for 1918, and emphasizes the excellent mechanical and electrical characteristics of Howell poly-phase motors.

Landers, Frary & Clark pictures Universal electric heating devices which are especially appropriate for gifts, and suggests the advisability of a stock to meet the coming demand.

General Electric Co. advertises that compression chamber lightning arresters insure continuity of line service. This company also devotes a page to the meaning of Mazda Service in lamp manufacture. Announcement is made of "The Electrical Advertiser," a help for dealers selling G-E apparatus.

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JOURNAL OF ELECTRICITY

VOL. 40 NO. 8

SAN FRANCISCO, APRIL 15, 1918

PER COPY, 25 CENTS

Why the *Hotpoint* Iron is so easy to sell



POPULAR Years of extensive national advertising in leading publications has made the Hotpoint Iron the BEST KNOWN.—over 3,000,000 Hotpoint Irons now in use.

QUALITY It is made of best quality material and by highest skilled workmen obtainable. We guarantee it against electrical and mechanical defect for one year from date of purchase by the user.

STRONG SELLING FEATURES—hot point always—cool handle, attached stand, “rest the wrist” thumb rest, hinged plug cord protector, and highly polished nickel finish.

and you should sell this well known electric appliance

because its remarkable popularity means **QUICK TURNOVER—LOW SELLING COST—and MINIMUM INVESTMENT REQUIRED** for you.

WE HELP YOU TO SELL HOTPOINTS—If you've not received a copy of Hotpoint Portfolio containing 1918 Spring and Summer Publicity Plans and Free Co-operative Selling Helps, please write us. Also ask us about our Preferred Distributer Agreement and Sliding Discount Plan.

HOTPOINT DIVISION
Edison Electric Appliance Company, Inc.
Chicago New York Ontario, Calif.



April 15, 1918

To the members of
Pacific Coast Section,
N. E. L. A.--

The Sierra & San Francisco
Power Company and The Coast
Valleys Power Company welcome
you to their home.

May the beauties of the
productive territory served by
our power lines prove of such
charm that your helpful presence
will be with us on many future
occasions.

Sincerely,
H. F. JACKSON,
Pres. & Genl. Mgr.



JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, APRIL 15, 1918

NUMBER 8

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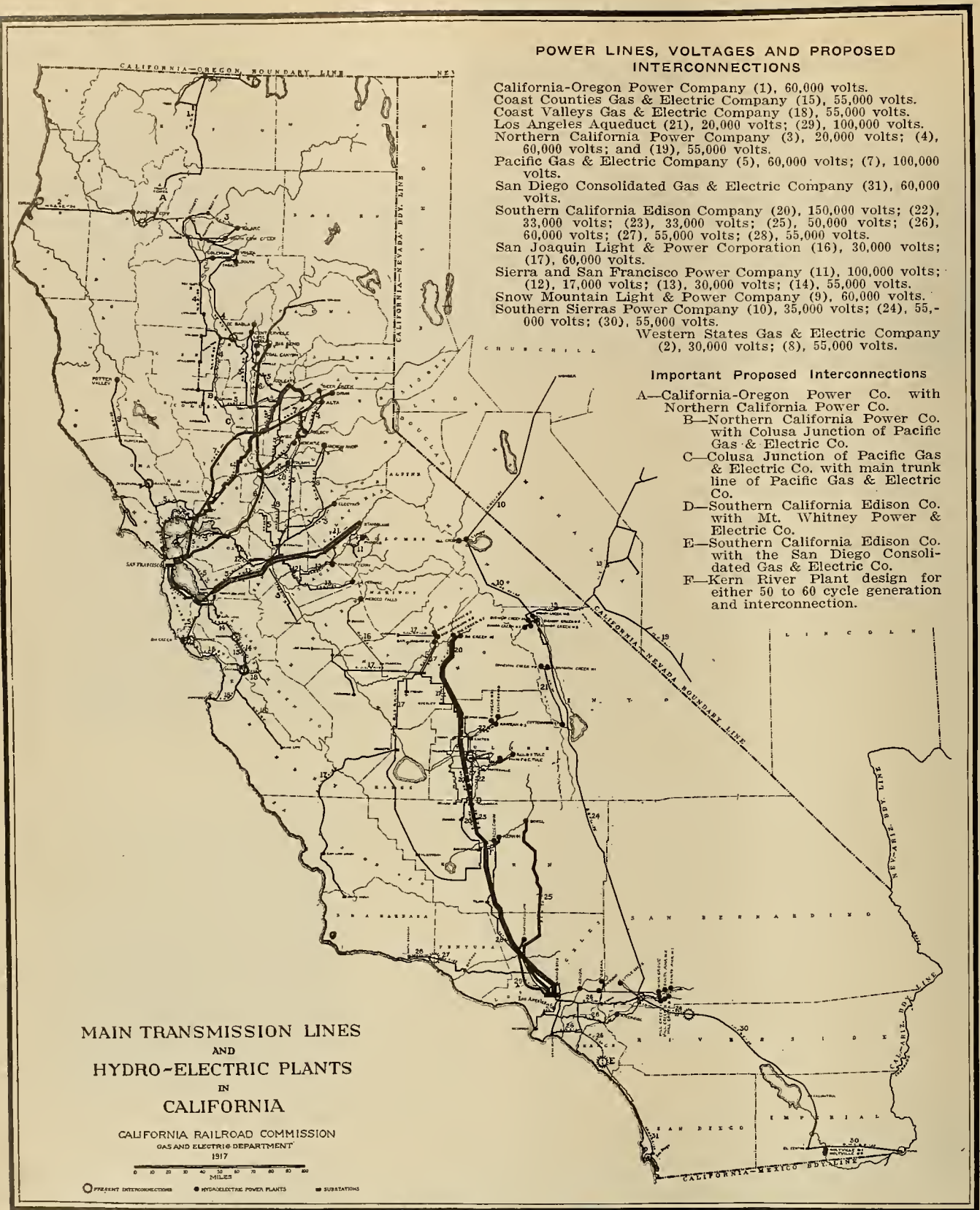
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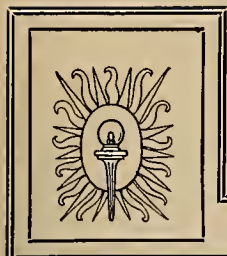
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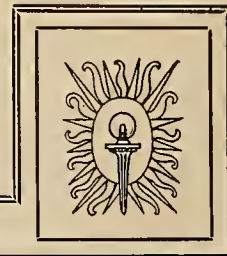


How the Upbuilding of the West is Helping to Win the War—X

HERE is exhibited a district served by the greatest hydro-electric companies in the world. This particular district produced almost a billion dollars in agricultural wealth and in excess of a billion dollars in manufactures during 1917 — an increase of 50 per cent over the previous year. Agricultural and industrial life in the West are so interlinked with electric power supply that any effort looking toward increasing the efficiency of its vast networks of hydro-electric power may well be classed as war service of the first order.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, APRIL 15, 1918

Number 8

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LOOKING forward confidently to the time when the bitterness of business competition shall give place to co-operation, we stand firmly for the principles of the United States in this war. For the cause is the same. It is this spirit which is leading us to more constructive ideals in business, because the success of each individual is dependent on the well-being of the whole industry, which is leading us as well to the doing away of national jealousies in recognition of the fact that we rise or fall with humanity's cause. This, without reservation, we support—



BUY A LIBERTY BOND

Effectual War Service

The great gathering at Del Monte, May 9-11, 1918, which ushers in the second annual convention of the Pacific Coast Section, N. E. L. A., will undoubtedly prove the most effectual war service gathering among men of the electrical industry in the West thus far convened.

Throughout its sessions the keynote of war service to the nation will be sounded on every side. The engineering papers dealing largely with questions of increased power production and more efficient generation, are all in accord with this single thought.

The commercial papers, too, sound forth the same patriotic theme. Every saving in effort that may be brought about by a truer spirit of co-operation is emphasized to the utmost, and earnest plans are being formulated as to how this may the best be brought about in harmony with the stress of national emergency now upon us.

Even the women's sessions are to flavor of this same ideal of higher and truer service to the nation. Unique in the sessions of the N. E. L. A. will be the women's war service meeting on the evening of Thursday, May 9, 1918, to which the men are invited, and at which time no other session of the convention will be held. This meeting, in charge of the women of the convention, is planned to feature how women, now such a growing factor of importance in business affairs, may the better render service both to our industry and to the nation at large. At the same time ideals of war service in the home, and how electricity may the better play its part of war service to the nation, will be forcefully brought out.

In serious times such as these no greater demand ever existed for such an all comprehensive gathering as that planned for the four branches of the electrical industry—the manufacturer, the jobber, the central station man, and the contractor-dealer—at the Del Monte convention.

Every reasonable effort is being made to obviate conflicting calls upon utility men during the convention week. Even the hearings of the California Railroad Commission are placed so that utility cases will not be set in conflict. Utility managers are urged to do all within their power to attend this convention in person and to see to it that as many of their men attend as can reasonably do so.

This is the one great expressive meeting of the year in our industry, and you cannot afford to miss it.

An honor flag means a record worth
advertising—

BUY A LIBERTY BOND



The Journal of Electricity has for over thirty years been an effective medium by means of which a point of contact has been maintained between the throbbing, pulsating activities of the West and the industrial and commercial life in the East.

Through this long period of time, it has been a matter of annual gratification on the part of its publishers to hear the beautiful words of praise expressed by Eastern men to representatives of the Journal of Electricity, commending the splendid agricultural, industrial and commercial strides that are visible on all sides in the West.

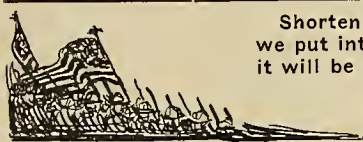
There has, however, come to the ears of the representatives of the Journal of Electricity, in recent months, an accusation against the West that Chambers of Commerce and other public spirited bodies of the West will do well to heed and to take measures to prevent the possibility of such accusations in the future having a foundation in fact.

The West has been unusually free from many of the inconveniences that have been brought on by the present national crisis. Since the source of our power supply is in so great a measure derived from water

power development, the dimming of lights has not been found necessary. Also, due to the beautiful climatic conditions that prevail in this section, little personal privation has been felt from shortage of fuel. And our agricultural production, amounting as it did to a vast increase in the past year, has made ample provision for food and clothing and other bodily wants.

But to allow an organized scheme of propaganda to proceed, emanating from the West, as has occurred during the past season, in an attempt so to parade these facts before the mental vision of the East is not only unwise from the standpoint of public policy, but in view of the national crisis leaves us open to well-merited criticism.

This nation is now welded together in an indissoluble chain of mutual helpfulness in the bending of every effort to meet the world crisis that is upon us. And that propaganda which attempts to forward favored sections over against less favored sections, due to present stress in national affairs, should be condemned.



Shorten the night—the more force
we put into the blow the more quickly
it will be effective—

BUY A LIBERTY BOND

Daylight saving means much to us all. The present law which caused all clocks to be turned ahead one hour the last Sunday in March, is perhaps the most remarkable accomplishment—a bloodless victory, as it were—in economic saving that has been instituted in the industrial and domestic life of America.

At first sight the law is commended simply upon its face value as a quick and effective means of starting the labor each day one hour earlier, agreeable to the old adage of “early to bed, early to rise, makes a man healthy, wealthy and wise.” But upon careful analysis it is seen to have a far deeper, fuller significance.

Although the new ruling will directly affect the electrical industry to the extent of a loss in revenue amounting to the vast total of some nine million dollars annually, with the saving of only some 300,000 tons of coal representing say \$900,000, still broad-minded electrical power men can not help but weigh the matter from the viewpoint of the vast resulting of good to the economic life of the nation and as a consequence they rejoice in being able to help contribute to the general good in this effective manner.

The one vulnerable and defective point in the new law is, however, found in the fact that the law is operative but seven months of the year. A nationwide educative campaign should be inaugurated at once to correct this glaring defect, which in so many respects kills the good effect of the present law.

An analysis of the power charts of central stations of the nation shows that by continuing the daylight saving throughout the year, the winter months would net a rather remarkable industrial saving of power, so extremely necessary in the heavy industrial strain now thrown upon the great electric generating companies.

In this analysis it is found by this extension of the daylight saving enactment that the day power load and the evening lighting load would not continue to overlap during the winter months as at present. The lessening of the peak load for central stations throughout the nation would as a consequence liberate 400,000 kw. of electrical energy, as brought out by Samuel Insull, president of the Commonwealth Edison Company of Chicago and chairman of the State Council of Defense for the great state of Illinois, in his recent address before the San Francisco Electrical Development League.

This liberation of 400,000 kw. of installed capacity would mean a tremendous industrial asset. Not only would it release from 150 to 200 millions of dollars in invested capital, but this power could be sold for absolutely necessary industrial activities, and thus bring a two-fold blessing without in any way imposing an unjust burden on anyone. The only possible penalization would be that caused by keeping the clocks ahead as now operating throughout the nation, if indeed this getting-up-early habit can in any sense be called a penalization.

The electrical industry engaged in the supplying of power, now represents an invested capital of nearly three billion dollars. But the important fact to bear in mind is that electric power is an indispensable part of our industrial life. Surely our legislators will not overlook this splendid possibility of bettering the industrial activity which means so much to us all at this critical period.

Really, now, how great is the service
you are giving?

BUY A LIBERTY BOND



Thoughtful men see in each day's work on the part of every American citizen a possibility for service just as laudable and just as effective at home as he who serves in the trenches. In a word, it is not so much what you do, but how you do it, that makes for the ultimate good in human endeavor.

Distinguished Service Orders

The increasing necessity of bringing out utility service in power generation to its maximum efficiency calls forth the wisdom of central stations inaugurating “distinguished service orders” for properly rewarding the men and women in the service of the company who are assisting in this timely work so helpful to the efficiency of the nation as a whole in the present trying period of national life.

Perhaps an illustration may serve better to point out the fuller meaning of the “distinguished service order.” The conservation of fuel oil on the Southern Pacific lines is regarded as of such importance that locomotive crews on every division are bending their energies toward getting out a maximum of good from the fuel consumed. Under recent orders, each class which makes the best showing on its respective division in the matter of fuel oil saving, will now be decorated the same as a hero on the Western front. The decoration takes the form of a bright red insignia on the circular plate which fronts the boiler of the locomotive.

In the operation of power plants, both steam and electric, and indeed in many other departments of utility life, the thoughtful attention of the operators, viewing each daily task from a new angle, namely, that the task in hand is a link in the great chain of effort that is helping to win the war, will do wonders in working out increased efficiencies and in conservation of material and labor.

The whole matter is one well worth the serious study of all men who have a part in directing the generation of electrical energy, and the conclusion is bound to follow after thoughtful consideration, that much good may be expected to follow any well-worked-out scheme for the inaugurating of a "distinguished service order."



The world might survive our failure,
but we should not—

BUY A LIBERTY BOND

The recent failure of the great Calaveras dam, some thirty-six miles southeast of San Francisco, does not in itself condemn the type of dam used in the design, but it does emphatically point to the necessity of more caution in the construction method employed.

Since the crest of the dirt dam that has been under way in construction for some years past is designed to tower to a height of 240 feet, thus breaking the world's record for dams of this particular type, its construction has been watched with unusual interest the country over.

In view of the wide interest that this catastrophe has attracted throughout the engineering world, a brief resume of the historical features of the work is timely. As early as 1875 plans for the construction of the Calaveras dam have been proposed and extensive explorations have from time to time been made to determine the proper location, and character and depth of bedrock.

This reservoir site, one of the largest in the West, is the largest storage reservoir in the Alameda system of the Spring Valley Water Company, which furnishes San Francisco with its domestic supply of water.

In the Calaveras Valley nature has provided a huge bowl three miles long and one mile wide, with a deep and narrow outlet at its northeasterly corner. The bowl offers a splendid opportunity to form a large lake, while the narrow outlet affords an admirable dam site whereby the lake may be readily formed.

The watershed of the catchment area directly tributary to the Calaveras Reservoir covers an area of 98.3 square miles, with possibilities of diverting into

it certain of the waters of upper Alameda Creek, thus creating a total drainage of 133 square miles.

The dam had reached a height of nearly 200 feet in its construction. The slope of the material on its up-stream side is 3 to 1, and that of the down-stream side $2\frac{1}{2}$ to 1. The top width of the dam is designed to be 25 feet and 1300 feet across.

In its construction, dry clay, sand and gravel were taken from the western side of the canyon and dumped on the upper and lower faces of the dam, so that the width of dry material from the up-stream side to the center was about one-third this distance, while on the down-stream side it was one-half the distance from edge to center. The remaining portion was hydraulicked in from the surrounding hills. This material consisted of about 50 per cent clay and 50 per cent sand and gravel. The coarse material was crushed before passing it into the conveyance pipe.

Since the hydraulicked material was dumped on the rims of the puddle pool, the sand and gravel were thus largely deposited against the dry embankment, while the clay worked its way toward the center of the pool.

In the Journal of Electricity for February 15, 1917, appeared an article on the Calaveras dam by a representative of the Journal who visited the structure during that time in company with a noted civil engineer from the Middle West, who had had years of experience in work of this nature.

Attention was called in the article referred to that while the puddle pool was only four feet deep, still a rod could be easily run down forty feet through the soft clay. The soft condition of the core and its apparent inability to harden was at that time thought by the visiting engineer to be a most troublesome and perhaps dangerous factor in the final completion of the work, due to the hydraulic pressure of the unhardened core exerting itself against the upper and lower edges of the dam.

On Sunday morning, March 24, 1918, the up-stream front of the dam slid forward, carrying away the outlet tower and perhaps causing a total loss in structure thus far completed. There are about two billion gallons of water now in the dam, although, when eventually completed, it is to hold sixty billion gallons. No water escaped, due to the gates remaining intact.

As to how the problem will be further handled remains a question of speculation for the future, but it is self-evident that the existence of the peculiar clay formation used as the core should sound a caution for future designs of this sort, and call for a design that would give greater stability in the solid portion of the embankment.

THE NEW JOURNAL SERVICE: The Journal of Electricity, ever alert to be the foremost in forwarding the latest and most helpful ideas in the upbuilding of the electrical industry in the West, will devote the entire issue of May 1, 1918, to the problems of the electrical-contractor dealer, with especial emphasis upon timely pointers as to how the "Goodwin Plan" of the National Association of Electrical Contractors and Dealers and the California Electrical Co-operative Campaign can be made of maximum helpfulness at the present time. No up-to-date man in the industry—central station man, manufacturer, jobber or contractor-dealer—can afford to be without the message this number will contain.

The issue of the Journal of Electricity for May 15, 1918, will contain the official discussions of the excellent papers of the Pacific Coast Section, N. E. L. A. This journal will be the first to publish this information of any of the great electrical papers in America, and thus again demonstrate its usefulness to the nation.



But the first, last and always foremost "New Journal Service" is unflinching service to the nation. To this end we urge all our readers to BUY A LIBERTY BOND





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THE DEL MONTE CONVENTIONS



ERVICE—the service that breathes deep from the innermost recesses of the human heart—is to be the keynote of the great war convention of the Pacific Coast Section, N. E. L. A., which convenes at Del Monte, California, May 9-11, 1918. Members of the National Electric Supply Jobbers Association of the Pacific Coast will assemble at Del Monte on Monday morning, May 6, 1918, the California Association of Electrical Contractors and Dealers will assemble on Wednesday morning, while the fall of the gavel for the great joint gathering of all branches of the industry under the auspices of the Pacific Coast Section, N. E. L. A., will sound at 10:30 a. m., Thursday, May 9, 1918. The tentative details of this great gathering are set forth on the opposite page. It is thought by those who have the best interests of the electrical industry at heart in the West that the beautifully impressive scenery enshrouding the far-famed Del Monte Hotel is a fitting setting for this the one great expressive gathering of the year among men of the electrical industry in the West.





C(ash) = $\frac{E(\text{verybody})}{R}$

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CONVENTION DETAILS



ACTS concerning the forthcoming convention have been given wide publicity in former issues of the Journal of Electricity.

In order that the business of this convention might progress with the least confusion possible, and thus make a fitting setting for the attaining of the high war service ideals that are in the planning for it, all the details of the convention are being worked out with unusual care. In the issue of the Journal

of Electricity for March 15, 1918, on page 308, was set forth a complete resume of the papers to be presented and full details of the duties of those who have the convention in charge.

There has been mailed to each member of the association full instructions concerning the purchase of tickets, the reservation of hotel accommodations, and other matters connected with hotel and transportation. Should any one desire further information, the inquiry should be sent to W. M. Deming, master of transportation, care Journal of Electricity, San Francisco, or to E. R. Northmore, assistant master of transportation, care Los Angeles Gas & Electric Corporation, Los Angeles. For other information concerning convention details, address inquiry to Robert Sibley, general chairman, care Journal of Electricity, San Francisco.

The expense connected with attendance at the convention may be summarized by saying that a general registration charge of \$5.00 will be made for each man at the convention and \$2.50 for each lady guest. This charge will include a ticket to the banquet and participation in all the extensive entertainments, including the seventeen-mile drive and the visit at the Highlands. Hotel accommodations range from \$5.50 to \$6.50 per day on the American plan, which includes the cost of all meals. The railroad fare is whole fare going and half fare return. The use of scrip or reduced fare tickets will not entitle the purchaser to half fare returning. Full details of securing railroad certificates and reservations for hotel accommodations are given in the printed instructions sent out by the master of transportation as alluded to above.

All the papers to be presented at the convention appear either in this issue of the Journal of Electricity or the issue of April 1, 1918.

Through the kindly co-operation of convention officials the excellent new matter that will be brought out at the Del Monte gathering will be immediately available for publication. The complete report of convention discussions will appear in the issue of the Journal of Electricity for May 15, 1918.

TENTATIVE PROGRAM, DEL MONTE CONVENTIONS MAY 6-11, 1918

MONDAY, MAY 6, 1918

9:00 a. m.—National Electric Supply Jobbers Association of the Pacific Coast assembles.

WEDNESDAY, MAY 8, 1918

9:00 a. m.—California Association of Electrical Contractors and Dealers assembles. Members' session and meeting for motor men and motor manufacturers.

2:00 p. m.—Special cars for the Del Monte Convention leave San Francisco attached to the southbound train No. 28; arrive Del Monte 5:45 p. m.

8:00 p. m.—Special cars for the Del Monte Convention leave Los Angeles attached to the northbound "Lark." Arrive Del Monte Junction 6:38 a. m. Arrive Del Monte 7:15 a. m.

THURSDAY, MAY 9, 1918

7:15 a. m.—Arrival of Los Angeles delegates.

8:00 to 10:30 a. m.—Reception of guests and registration at Hotel Del Monte.

10:30 a. m. to 12:00 m.—Opening Meeting—Ladies invited. Convention opened by brief patriotic exercises. President's Address. Reports of Secretary and Treasurer. Report of Membership Committee. Announcements.

12:30 to 2:00 p. m.—Luncheon Meetings of Executive Committee and Convention Committee.

2:00 to 5:00 p. m.—War Service Session of Engineering Section. All in attendance at convention are invited. Report of Engineering Committee on "War Service Power Problems."

Lantern slide lecture on "Possible Water Power Development in California," by F. H. Fowler, electrical engineer for the Forest Service. Discussion of papers on "Possible Power Development," by F. H. Fowler; "Water Resources in Southern California," by H. A. Barre; and "Joint Operation of Power Companies," by J. P. Jollyman.

2:00 to 5:00 p. m.—Reception for Ladies.

4:00 to 5:30 p. m.—Exhibit of beautiful color photography plates and views by L. P. Lowe of San Francisco. Open to all.

8:00 to 9:30 p. m.—War Service Session of Ladies of Convention. All men and women in attendance at convention cordially invited to be present.

Singing of "America" and statement of purpose of the Women's War Service Session by Mrs. H. F. Jackson. "What Women Can Do to Help Maintain the Public Utility Efficiency," by a woman representative from the Southern California Edison Company.

"How Electricity May Render War Service in the Home," by Mrs. George A. Hughes.

"War Service Problems for Home Solution," by a noted woman speaker to be announced later.

Singing of "Star Spangled Banner," and Adjournment.

FRIDAY, MAY 10, 1918

9:00 a. m. to 12:00 m.—Engineering Section. Discussion of "A Questionnaire on Power Conservation," and papers on Power Plant Losses," by R. J. C. Wood; "Improvements in Water Wheel Efficiency," by E. C. Hutchinson; "Hydro-electric Economies," by J. P. Jollyman; "Transmission and Distribution Losses," by R. E. Cunningham; "Iron and Steel Conductors," by R. C. Powell; "Standardization of Pin Type Insulators," by L. M. Klauber and R. E. Cunningham; "Substitute for Cedar Poles," by L. M. Klauber; "Insulator Deterioration," by J. A. Koontz; and discussion of "Report of Representatives on Preparation of Safety Orders."

9:00 a. m. to 12:00 m.—War Service Problems of the Commercial Section.

9:00 a. m. to 11:00 a. m.—Report of Commercial Committee on "Better Selling Methods," and report of sub-committee on "Industrial Electric Heating." Discussion of paper on "Retail Selling Practice," illustrated by moving pictures representing approved standard practice.

11:00 to 11:45 a. m.—Discussion of paper on "Some Contractor Problems," by J. M. Carlson.

11:45 a. m. to 12:15 p. m.—Accounting Section Report.

12:15 p. m.—Convention Picture. Prompt attention by all in attendance at convention is urged.

2:00 to 4:00 p. m.—War Service Problems of the Commercial Section.

2:00 to 3:00 p. m.—Paper on "Development of the Community of Interest," by T. E. Bibbins, and its discussion.

3:00 to 4:00 p. m.—Paper on "Bricks Without Straw," by G. B. McLean, and its discussion.

2:30 to 5:00 p. m.—Auto Ride for Ladies, including a visit to the beautiful Pebble Beach and the Marine Gardens.

4:00 to 5:00 p. m.—General Business Session of the Convention. Report of the Public Policy Committee, Nominating Committee, Resolutions Committee, and other general business.

7:00 p. m.—Grand War Service Banquet. R. H. Ballard, toastmaster. Charles Mills Gayley, speaker of the evening.

SATURDAY, MAY 11, 1918

9:00 a. m.—Unfinished Business. Committee meetings and any other matters to be disposed of, announcement of which to be made later.

9:30 a. m.—Assemble for Out-of-door Sports. Golfing, Tennis, Swimming.

1:30 to 5:00 p. m.—Seventeen-mile Drive and other scenic wonders, by auto, and Tea at the Highlands.



Why economize if not to buy Liberty Bonds? — BUY A LIBERTY BOND



The Spaulding Dam, from which the water is supplied which feeds the Drum power plant and lower down the Halsey and Wise plants

HYDRO-ELECTRIC ECONOMIES

BY J. P. JOLLYMAN

(Seventy-seven per cent efficiency overall is the high record achieved at the Wise power house. The effective system of tests and checks, the practice in regard to replacements and improvements which have made this result possible, are here pointed out by an engineer who had much to do with the actual constructions involved. In view of the fact that the Pacific Gas & Electric Company serves perhaps the largest territory of any single electric distribution system in existence, and that the installation in at least one of the plants mentioned has broken a world's record, makes this analysis of problems one of peculiar interest. The paper is a portion of the Engineering Committee's war service report for the coming Pacific Coast Section, N. E. L. A., convention.—The Editor.)

1. When considering the actual plant efficiency of the several plants of the company, it should be remembered that most of the older plants have been materially altered since originally planned. In some cases new generating units have been added without increasing pipe line capacity, in others additional pipe lines have been installed along with new generating units. These changes have caused a departure from the theoretically desirable distribution of losses in the several elements constituting a plant, and a statement of the over all losses in such plants cannot be used as a guide when planning economies for other plants.

In the more recent plants, which have been constructed substantially as originally designed, the efficiencies of the several elements are more nearly consistent and some illustrations will be given. From an efficiency standpoint, the only elements in a hydro-electric plant over which the engineer has any considerable control are the pipe lines and the water wheels or turbines. The difference in efficiencies of modern generators and transformers is very small.

The following efficiency data must be regarded as approximate and subject to such errors as may be involved in the methods of test indicated:

The use of two prime movers per generator at Drum and at Halsey should be noted as contributing to the range of load over which the plant can be efficiently operated.

The best efficiencies for the impulse wheels as shown by these tests is about 82 per cent and for Francis turbines from 85 per cent to 87 per cent. That these efficiencies are approximately correct has been confirmed by the results of a series of tests on other units on the system. While efficiencies several per cent higher than these have been claimed for impulse wheels and for turbines, it is felt that they will not be obtained except with the very highest class of apparatus installed under favorable conditions.

2. Records are kept of the amount of water supplied all the hydro-electric plants. At Halsey and at Wise the records are furnished by Venturi meters, at all other plants by gage readings in flumes or ditch sections near the head of the pipe lines.

3. We have considered that accurate, continuous records of the amount of water supplied the hydro-electric plants was of sufficient importance to justify the installation of Venturi meters in the pipe lines at Halsey and at Wise, which are our most recent plants.

Approximate Efficiency Data

Plant:	Drum	Halsey	Wise
Head	1,375 ft.	328	519
Length of pipe line	6,282	5,418	8,546
Generating units	2	1	1
Water wheels per unit	2 Impulse	2 Turbine	1 Turbine
Size each water wheel	9,500 hp. max.	9,000 hp. max.	20,000 hp. max.
Generator kw.	12,500	12,500	12,500
Transformers	6	3	3
Kw. each	4,250	4,250	4,250
Efficiency of pipe line	94 % at 25,000 kw.	94 % at 10,000 kw.	94.2 % at 12,500 kw.
Efficiency of water wheels	80 % at 8,500 hp. ea.	85 % at 8,500 hp. ea.	86 % at 19,000 hp. ea.
			87 % at 17,000 hp. ea.
			85 % at 13,000 hp. ea.
			77 % at 8,000 hp. ea.
Efficiency of generators	82 % at 6,500 hp. ea.	82 % at 6,500 hp. ea.	96.3 % at 12,500 kw.
Efficiency of transformers	80 % at 4,000 hp. ea.	73 % at 4,000 hp. ea.	98.7 % at 4,250 kw.
Allowed for excitation	96.3 % at 12,500 kw.	96.3 % at 12,500 kw.	98.7 % at 12,500 kw.
Efficiency overall	98.7 % at 4,250 kw.	98.7 % at 4,250 kw.	77 % at 12,500 kw.
	0.7 % at 25,000 kw.	0.7 % at 10,000 kw.	
	71.0 % at 25,000 kw.	73 % at 10,000 kw.	
	74.0 % at 20,000 kw.		

Pipe losses measured by gages.
Water wheel efficiencies based on water quantities measured by volume drawn from forebay at Drum and on Venturi readings at Halsey and Wise.
Generator and transformer efficiencies were taken from factory tests.



The West has already several world's records—add another — BUY A LIBERTY BOND



4. We have no automatic nozzle control on any of our impulse units. Only one unit at a time is used for governing, so the need for automatic control is not very great. We find that a considerable amount of intelligence must be used in judging the amount of surplus water required for governing margin, and have not so far felt that the benefits of an automatic control were sufficient to justify its installation under present circumstances.

All of our high head Francis turbine units are equipped with relief valves which are set to close automatically after having been opened by a rapid closing of the turbine gates.

5. We have sufficient forebay capacity to enable us to run at about 80 per cent load factor during flood water and 70 per cent load factor during the period of the use of stored water. With any less forebay capacity we would undoubtedly waste water during the flood water season under the present conditions of load and power supply. The amount of such waste is difficult to estimate accurately, but would be around 200,000 kwh. per day.

6. Just when it pays to renew worn impulse wheel buckets depends largely on whether an improved form of bucket can be substituted for the worn buckets. Improvements in efficiency may be expected from a change in buckets if (a) the form of the original buckets is not very nearly like the best modern types; (b) if the buckets have become pitted or waved; (c) if the buckets have so worn at the entrance as to spill live water; (d) if the buckets have holes worn through them to a material extent.

7. We have secured improvements in the efficiency of several units on our system by replacement of the original equipments with new apparatus of better design. A statement regarding some of these changes may be of value by calling attention to some of the specific defects which were overcome:

(a) In one plant we had several 2000 kw. 240 r. p. m. units originally equipped with double runner impulse wheels 11 ft. 6½ in. pitch circle and 2 ft. apart. The head is 1466 feet.

On one of these units worn buckets of good design were replaced by new buckets of the most modern type. The full load output was increased 2½ per cent.



The penstock piping at the Wise power house—over 8000 feet in length. Note the glimpse of the pipe line to be seen in the far distance in the upper left-hand corner. In spite of such immense distances a very high efficiency is maintained.

In this case the old buckets had worn quite smoothly and were of a design which would ordinarily be considered fairly good. Some of the improvement was undoubtedly due to the improved form of bucket.

(b) Examination of these wheels showed that considerable water was striking the backs of the buckets. It appeared that this was most probably



INTERIOR OF THE DRUM POWER HOUSE

Here is shown the interior of the most powerful of the series of hydro-electric plants that comprise the Lake Spaulding Development of the Pacific Gas & Electric Company. The waters of the high Sierras are first stored in Lake Spaulding, and as occasion for their use arises they are then passed successively through the Spaulding, the Drum, the Halsey and the Wise power houses. The system represents one of the largest and most efficient chain of power houses evolved in hydro-electric practice in the West.



Make it a 3,000,000,000 volt shock—slightly warm for the Kaiser—BUY A LIBERTY BOND



caused by the discharge of one wheel striking the backs of the buckets of the other. A baffle was placed between the two runners, resulting in an increased output of $3\frac{1}{2}$ per cent at full load. It should not be inferred that it will always be advantageous to install baffles between the runners of double wheels. In another plant with similar generators, but where the head was 700 feet and the runners 3 feet 6 inches apart, no improvement was obtained with a baffle between the runners.

(c) The results of our comparative tests on a number of units in different plants on the system showed that the wheels with specific speed (obtained

from the formula $\text{specific speed} = \frac{R. P. M. \times \sqrt{H. P.}}{1.25 \text{ Power of Head}}$

which gives higher values for greater ratios of jet to wheel diameter) around 3.5 to 4 gave the best efficiencies. Since the specific speed of the two runner wheels on these units is only 1.02, it appeared there should be an advantage in substituting a single runner for the double runner. This was done with a gain of about 10 per cent at full load, as compared with the original wheels with worn buckets and without the baffles mentioned above.

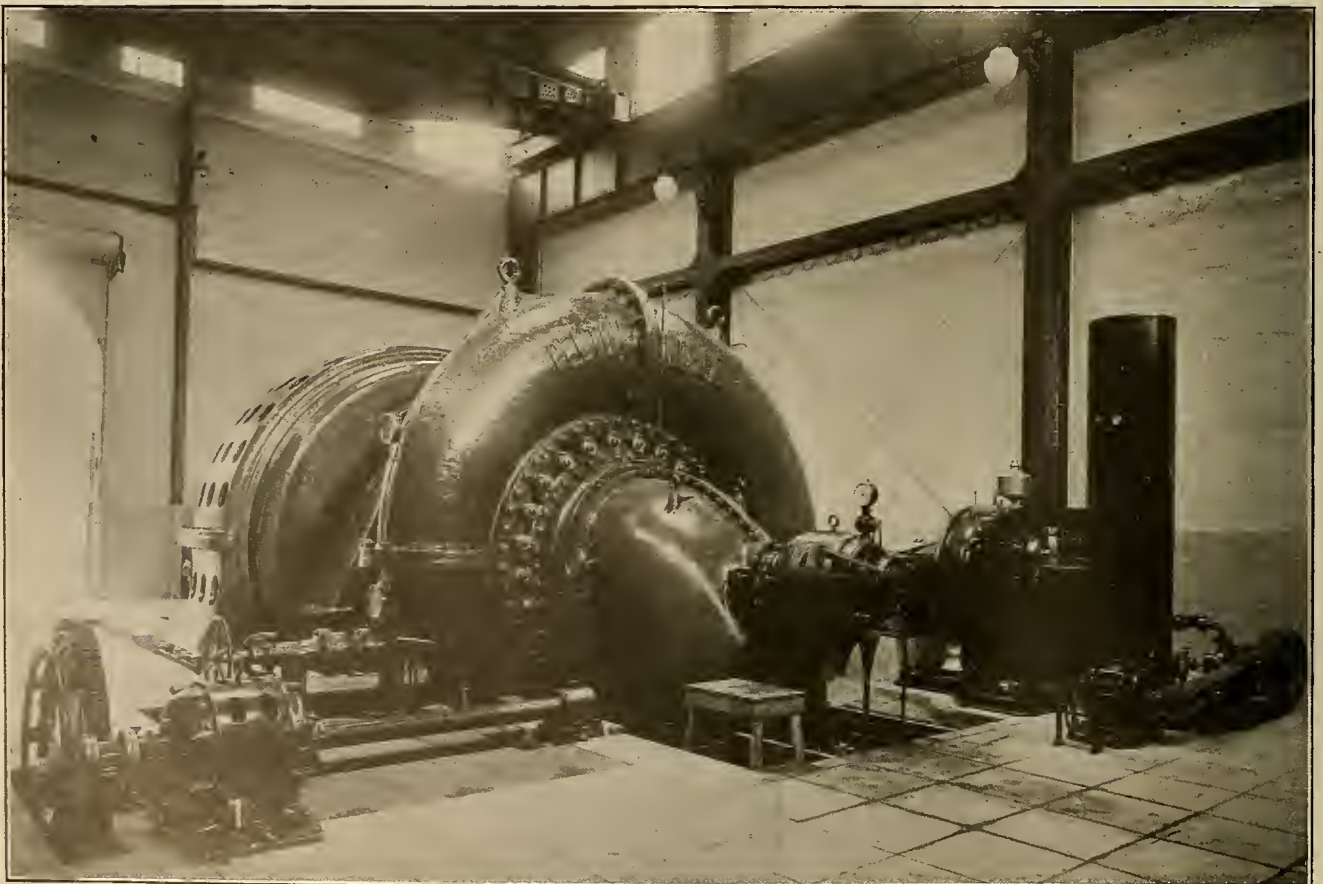
(d) Due to the progress of the last few years in the design of impulse wheels with single jets for higher specific speeds and in the design of Francis type turbines for lower specific speeds, the range of head-

speed-horsepower combinations not covered by these two types has been materially reduced. Since these two types of water motors are much superior to any other types now known, it is sometimes possible to replace an intermediate type such as the Girard turbine with an impulse wheel or a Francis turbine.

We have one plant which was originally equipped with 1000 kw., 400 r. p. m. units, driven by Girard turbines under 660 foot head. These turbines had very poor efficiency and wore out rapidly. The specific speed of this combination is 4.64 and is rather high for an impulse wheel. However, impulse wheels were finally installed in place of the Girard turbines and gave an increased output between 50 per cent and 60 per cent.

(e) In some cases it may be found that the pitch diameter of impulse wheels may not be correct for the head that is actually used. This condition may arise from an improper design of the wheel, from the use of a lower head than the wheel was planned for, or to a limited extent from a wrong nozzle setting. The correct relative velocity of the pitch diameter of an impulse wheel to the spouting velocity depends somewhat on the specific speed being somewhat less for high specific speeds than for low specific speeds. The range of correct relative velocities probably lies within the limits of 44 per cent to 47 per cent.

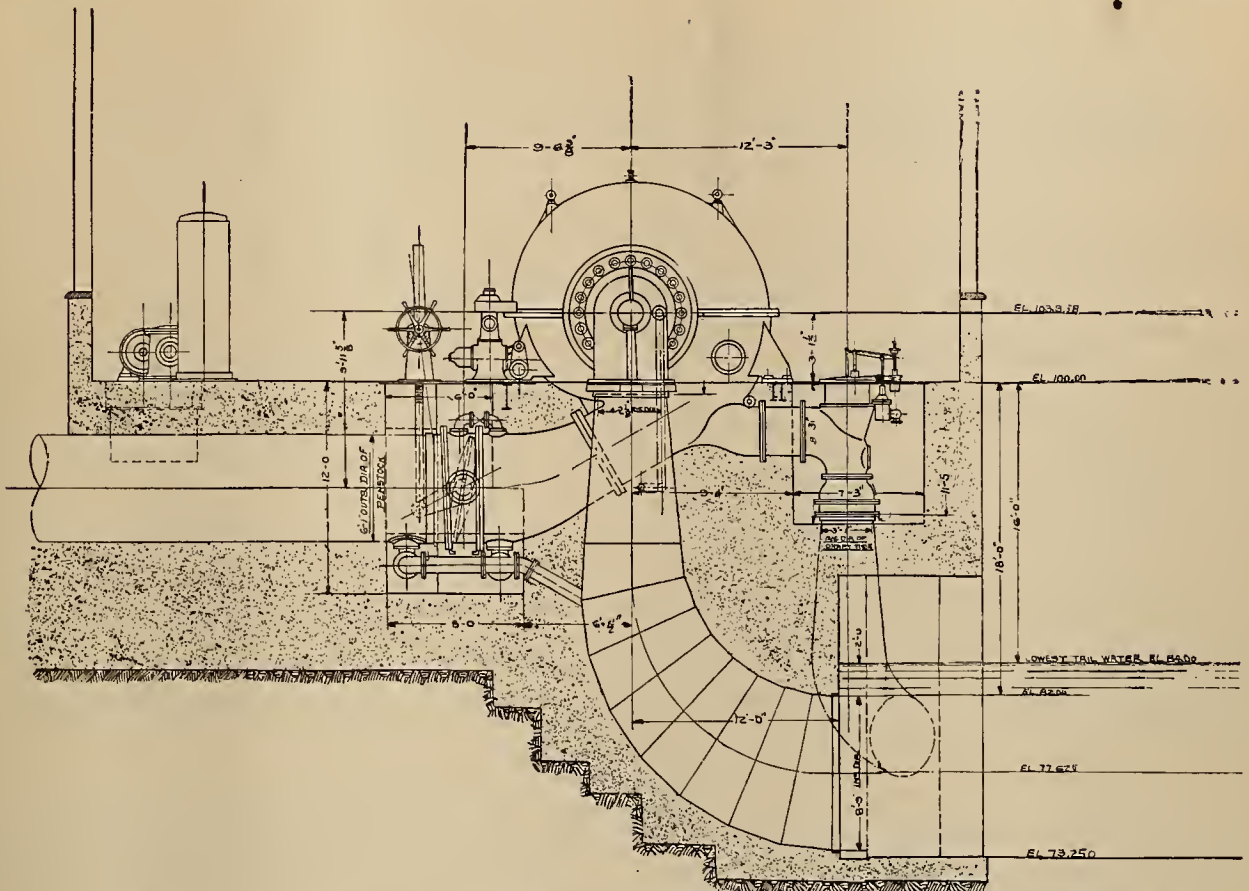
We had one case where the original wheels had too small pitch diameters, giving a ratio of bucket velocity to jet velocity of 40 per cent. These wheels



The interior of the Wise power house, showing the giant generators. This represents the largest single discharge unit in existence



Of course you are helping in other ways, but don't forget this need—BUY A LIBERTY BOND



Cross section view of the Halsey plant. The efficiency of the high head Francis turbine shown here is rated at from 85 to 86 per cent

were replaced with new wheels with a velocity ratio of about 45 per cent, and with buckets of improved form. The total improvement in efficiency was several per cent.

We had another case where the wheel replaced had too high a relative velocity, the ratio being a little over 50 per cent. Here, as in the opposite case, a marked improvement was secured with a new wheel of correct velocity ratio and with improved buckets.

In neither of these cases were we able to segregate the improvement due to the correction of relative velocities from the gain due to the superior shape of buckets. We feel that the former undoubtedly contributed to the total result.

In several cases we have secured some gain in output by raising the nozzles slightly above the position recommended by the makers.

Improvement in the efficiency of Francis turbines can be expected from the renewal of badly worn runners or guide vanes. In some cases it may be possible to improve the design slightly if the worn runner shows evidence of faulty design. This evidence is most likely to appear as honeycombing at the points where the flow lines are not just right.

We have replaced worn runners and other parts in some of our Francis turbines, but have not been able to determine what improvements have resulted.

In the foregoing, the improvement of impulse wheel buckets has been mentioned in several cases and the question naturally arises as to what constitutes the best form for such buckets. This is a rather

difficult question to answer without undertaking a study of the rather complicated question of the relative motion of the buckets and of the jets of water which pass through them. It is believed that the present models of buckets used by the foremost builders of impulse wheels represent fairly close approximations to the best possible forms, and are distinctly superior to any type that does not quite closely approach them in form.

Under present day conditions some improvements in water wheel efficiencies seem to be the most practical betterments that can be undertaken. The costs are relatively small and reasonably prompt deliveries can be had.

ELECTRICITY FOR WOUNDED SOLDIERS

An electrical apparatus which totally numbs the severest nerve pains, while, at the same time, gradually bringing about a permanent cure, a machine which will cure acute "water on the knee" in one 20-minute "exposure," and another which charges the patient up like a storage battery, are a few of the wonders of the Radcliffe Infirmary for wounded soldiers at Oxford.

The problem of how to exercise electricity on paralyzed muscles without unduly stimulating the healthy ones, has been solved by means of a newly perfected system of condensers, which causes the injured muscles slowly to contract and relax, while the healthy ones remain quiescent.



The only saving which is justified is that which is put to a good cause — BUY A LIBERTY BOND



QUESTIONNAIRE ON POWER CONSERVATION

(A remarkable collection of data in regard to practice with a view to the economy of energy in both hydro-electric and steam generating plants is given here. The information is presented in the form of questions and answers and contains a most comprehensive digest of present day conditions in California. The paper forms a portion of the Engineering Committee's war service report for the Pacific Coast Section, N. E. L. A., convention of May 9-11.—The Editor.)

In order to give the engineers of all member companies an opportunity to benefit from the work of their fellow engineers along the lines of conservation, which all are practicing or working toward this year, the Engineering Committee has collected such data as could be obtained on this subject largely as answers to a questionnaire, and is publishing the same as follows, with the idea of stimulating convention discussion of the points brought up.

In several cases the questions have resulted in such a complete analysis of the situation as a whole with respect to either hydro-electric plants, distribution systems, or steam plants, that the answers forming this analysis have been kept together and presented in the form of a paper constituting a part of the convention proceedings. Examples of this are the papers by Mr. R. J. C. Wood, entitled "Power Plant Losses"; Mr. J. P. Jollyman, entitled "Hydro-electric Economies"; and Mr. R. E. Cunningham, entitled "Losses in Transmission and Distribution Systems." These papers will be found in this and the previous issue of the Journal of Electricity, and should be referred to as additions to the following data.

HYDRO-ELECTRIC ECONOMY

1. What percentage of the theoretical energy in the water taken by any of your power houses is realized at the busbars?

San Joaquin Light & Power Corporation—At our plant known as San Joaquin Powerhouse, consisting of four 4000 kva. impulse driven generators, we attain an average efficiency of 74.47 per cent. That is, we deliver on our busbars the above percentage of the kinetic energy. At our other power houses we are unable to determine absolutely the percentage efficiency, which is secured from the available water, with the exception that we can measure the second feet and from this knowledge compute the results obtained in the busbar. This result varies at the different plants from 55 per cent to 80 per cent efficiency.

Great Western Power Company—We obtain 65 per cent of the theoretical energy in the water power. When the plant was new, this figure was 70 per cent.

Southern Sierras Power Company—We actually obtain an average of 71 per cent combined efficiency at our hydro-electric plants, including all losses and water wasted in governing, etc., while in some cases where no governing is being done, the combined efficiency reaches 76 per cent.

Sierra and San Francisco Power Company—Annual efficiency about 65 per cent; 1490 ft. static head; 1400 ft. effective head. Average use is about 45 cu. ft. of water per kwh. This varies, depending on load factor, speed regulation and elevation of forebay.

2. Where this is known, how do you measure your water?

San Joaquin Light & Power Corporation—At the San Joaquin Powerhouse the water flowing through each of the two pipe lines is measured by Venturi meters, which are equipped with both integrating and recording mechanisms, so that our average of 74.47 per cent efficiency as mentioned under a preceding question is very close to being accurate.

Great Western Power Company—The water was originally measured by the Pitot tube method. Later it has been taken by flow meters.

Southern Sierras Power Company—We measure our water in one case with a General Electric flow meter and in other cases by means of weirs.

Sierra and San Francisco Power Company—The water is conveyed from the converting dam at Sand Bar, through a timber flume approximately 15 miles long to a forebay reservoir, thence to the plant through two pipe lines, under a static head of approximately 1500 feet. The flume has been cross sectioned at a point about 1000 feet from the headworks. A discharge curve has been established from velocity readings taken with a Lally meter. The mean flow for the 24 hours is assumed to be the mean of three daily readings taken at 7 a. m., 12 noon, and 6 p. m. This is converted into millions of cubic feet, from which is deducted any water that may be turned out of the flume to permit of repairs.

The forebay reservoir has a capacity of approximately 13 million cubic feet. From readings of the elevation of the water, taken at 9 p. m., there is determined the amount of water which was stored or used from the forebay, which amount is deducted from, or added to, the net amount delivered into the forebay from the flume. The amount of water in cubic feet is divided by the kilowatt hours generated for 24 hours ending at 12 o'clock midnight, and the quotient is used as a comparative factor in determining the daily efficiency of the plant.

3. To what extent does it pay to get an accurate measurement of the amounts of water going through your plant?

San Joaquin Light & Power Corporation—At our various plants we know absolutely the number of second feet of water delivered to each plant. From this knowledge we can determine closely the efficiency of each plant.

We have been able to avail ourselves of this knowledge to decrease our operating cost. For instance, knowing absolutely the quantity of water which we take from storage and the quantity of water which we obtain from the natural flow of the streams, we have been able to effect a considerable saving by being able to accurately differentiate between the stored water and the natural flow of the stream in making our annual settlement with the government. The additional accuracy in being able to make and record these measurements of water has resulted in cutting down the government charges and as the rate due the government for water increases year by year, the saving will also materially increase.

Great Western Power Company—Accurate measurement of the water is very important in general to determine when turbine repairs are profitable.

Southern Sierras Power Company—As we operate about two-thirds of each year on stored water we consider it absolutely necessary to obtain an accurate measurement of the amounts of water used. In fact, we have established a constant indicating the number of kw. per second foot for water used at each plant, and this constant is worked out daily at the generating plants and incorporated into their daily report. Whenever constant drops below what we consider a good operating efficiency it is the subject of immediate investigation.

Sierra and San Francisco Power Company—It is very desirable. I do not think our method is sufficiently accurate.



Economize by doing it better, and buy a bond with the proceeds—BUY A LIBERTY BOND



A considerable investment and expense is justified in keeping fully informed on the plant losses and efficiency.

4. Have you on impulse wheels any automatic system of closing needles to reduce deflection of nozzles, or of closing by-passes opened on falling loads, and to what extent do they improve your water economy?

San Joaquin Light & Power Corporation—We have no deflecting nozzles on any of our power houses. Control of the water is handled through auxiliary nozzles and by-pass valves which operate only on sudden pressure rises, and are in the nature of relief valves to prevent excessive pressure rise.

Great Western Power Company—With properly equipped relief valves, high head turbines are able to take care of wide fluctuations of load without any loss in water.

Southern Sierras Power Company—On the impulse wheels in our governing plants we regulate the water flow by means of needle nozzles connected to auxiliary needle type relief nozzles. We know that this type of nozzle saves at least 50 per cent of the water that would be wasted in regulation by the deflecting or deflector type of nozzle, but we do not know the exact amount of saving obtained.

Sierra and San Francisco Power Company—No.

5. Have you any cases of special value involving the use of forebays or afterbays to avoid spilling water on account of daily load variations?

San Joaquin Light & Power Corporation—Our water waste is reduced to a minimum. On the San Joaquin River we have not only forebays, but we have afterbays. At one of our power houses we have a small retaining dam which can store approximately 250 acre feet. At the other power houses we can also store a quantity of water. Our waste of water is practically reduced to a minimum, as the dispatcher handles the load and the flow of water in such a way that he can store water during the times of minimum load and let the water out of the forebays and afterbays as the load increases. We have found these forebays and afterbays of exceptional value to enable us to handle the water coming out of storage. During the last year we wasted practically no water. Any water coming from our storage reservoir was used to advantage through all power houses.

Southern Sierras Power Company—On Bishop Creek we have five water power plants, all using the same water and in this case the forebay which serves as the intake for the upper plant is of sufficient size to take care of all daily load variations. The water after being used through the upper plant, is discharged directly into a small forebay which serves as an intake for the next plant below, and this forebay is only of sufficient size to take care of load variations for short periods. This condition applies to the balance of the plants below.

Sierra and San Francisco Power Company—Yes. Peak load capacity, insurance on flume breaks, settling the water to reduce water wheel wear, storage of off peak surplus power from our own system as well as other systems, and delivery during time that there is a demand above the capacity of other plants or systems, or our own flume capacity. We are taking 50,000 kwh. from the Great Western Power Company between 9 p. m. and 5:30 a. m., and delivering back to the Pacific Gas & Electric Company between 7 p. m. and 9 p. m. a portion, or all, depending on our own needs to make up any shortage of power.

Southern California Edison Company—For data on this and other questions on hydro plant economies, see paper by Mr. R. J. C. Wood entitled "Power Plant Losses," forming part of the convention proceedings and published on page 344 of the Journal of Electricity, April 1, 1918.

6. Have you any information on the effect of bucket wheel renewals on efficiency, and can you throw any light

on the problem as to when it pays to replace buckets to maintain efficiency?

San Joaquin Light & Power Corporation—No.

Great Western Power Company—Francis type turbines can be improved by at least 2 to 3 per cent by installing clearance bands to reduce the leakage between the scroll case and the runner.

Sierra and San Francisco Power Company—No.

7. Have you had any wheels, nozzles or buckets replaced by others of improved design, and if so, what data have you on the betterment?

San Joaquin Light & Power Corporation—No.

Southern Sierras Power Company—About three years ago the low efficiency at one of our plants was investigated, after which new buckets were installed on three 4000 horsepower wheels, resulting in a net gain of 1200 kw. output using the same amount of water and the same power plant equipment other than the buckets. A year later two sets of water wheel buckets purchased several years ago were replaced by a later design with a resulting increase of 700 kw. on two 2000 kw. units.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—For answers to this and other questions regarding the conservation of energy in water power plants, see paper by Mr. J. P. Jollyman among the convention proceedings, on the subject of "Hydro-electric Economies." This paper appears elsewhere in this issue of the Journal of Electricity.

8. Can you give data on other hydraulic economies of general interest?

San Joaquin Light & Power Corporation—No.

Southern Sierras Power Company—Other hydraulic economies to which we pay particular attention are liberal designs in intake screens and chambers and the installation of flow line and pressure pipe of liberal size.

Puget Sound Traction, Light & Power Company (submitted by Mr. George E. Quinan on behalf of the Northwest Electric Light and Power Association)—A suggestion along the lines of conservation of equipment, which you do not seem to have covered in your list of questions, would be the possible increase in generating capacity to be obtained by improved ventilation of generating units, whose prime movers have sufficient capacity to carry more load. We have recently increased the continuous rating of two 10,000 kva. General Electric water wheel driven units up to 16,300 kva. each, by installing Sirocco fans on the rotors, enclosing the ends of the machines with sheet iron, so as to obtain maximum use of the air handled, and rewinding the armatures with a mica high temperature insulation. We have ordered material for the rewinding of another machine, a 5000 kva. water wheel driven unit, and will install fan blades on its rotor and expect to get another 1000 kw. of capacity out of it.

There is probably a good deal of generating equipment in use on the Coast built prior to 1913, which would safely carry more load than the operating companies now dare to place on it, and in a good many cases the operators would feel justified in increasing the amount of load carried if they had some means of determining the maximum temperatures reached. In some instances the installation of temperature coils in the armature windings would give the desired information and at a very insignificant cost.

TRANSMISSION AND DISTRIBUTION ECONOMIES

1. What percentage of your total energy generated is sold to consumers?

San Joaquin Light & Power Corporation—1916, 75.6 per cent; 1917, 77.2 per cent.

Great Western Power Company—75 per cent of the total energy generated is sold to the consumers.



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San Diego Consolidated Gas & Electric Company—Percentage of total generated energy sold during 1917, 77.9 per cent; loss, 22.1 per cent.

Pacific Gas & Electric Company—The percentage of the total energy generated that is sold to consumers is not known exactly. To determine this ratio would involve the addition of hundreds of thousands of meter readings, and this is not done for the system as a whole. It is believed to be between 54 per cent and 64 per cent.

2. Of the difference between the two, do you know how much is lost in your transmission system, and how much in your distribution system; that is, have you sum totals of metered energy passing through your distribution substations?

San Joaquin Light & Power Corporation—Yes.

	1916	1917
Transmission loss	15.8%	15.0%
Distribution loss	8.6	7.8
Total loss	24.4	22.8
Kw. generated	110,920,894	143,129,588
Kw. on substation meters	93,390,360	121,600,477
Kw. sold on register and consumers' meters	83,886,520	110,264,792

Great Western Power Company—15 per cent is transmission high tension step-up and step-down transformer losses, while 10 per cent of the loss is in the distributing system.

San Diego Consolidated Gas & Electric Company—All loss was in the distribution system; operated no transmission system during 1917.

Pacific Gas & Electric Company—The amount of power lost between the generator terminals and the low voltage side of the substation transformers is about 20 per cent. This includes losses in step-up transformers in our own generating plants, the losses in the high tension lines and the losses in all substation transformers. The losses in some of the distributing systems has been found to be between 20 per cent and 30 per cent.

Southern California Edison Company—See paper by Mr. R. E. Cunningham on this subject among the convention proceedings, page 349 of Journal of Electricity, April 1, 1918.

3. What steps have you taken to reduce transmission and distribution losses, and what results do you estimate from such steps?

San Joaquin Light & Power Corporation—We have reduced our transmission and distributing losses by decreasing our mileage of 30 kv. transmission and replacing it by 70 kv. transmission lines. We have built a large number of tie lines, both for transmission and distribution, and reduced the distance between our distributing substations by building additional transformer stations and thereby reducing the length of the distributing lines from the centers of supply.

San Diego Consolidated Gas & Electric Company—Steps taken to reduce distribution losses:

- (a) Close check on customers' accounts to note quickly a dead or dying meter.
- (b) Routine testing of meters, particularly of large power customers, to catch slow meters.
- (c) Elimination of unnecessary transformers. Changing of unnecessarily large transformers. Arrangements made to cut off large customers' banks when not in service.
- (d) Selected transformers having 2400 rather than 2200 volt ratings (in the days before the advent of the so-called universal transformer), thus reducing core losses.

Impossible to estimate the results of these steps. System conditions have so changed and average distance of transmission so increased that it is not possible to tell how much of the economies instituted balance the increased losses due to increased territorial extent.

Pacific Gas & Electric Company—Additional transmission lines have been planned to relieve the most heavily loaded parts of the transmission network. Some have been constructed, some are under construction, and the net results

are impossible to estimate since the load has grown so rapidly.

A great many additions have been made to the distribution systems with a view to relieving overloaded apparatus. Some distribution transformers which have aged excessively have been removed. The results of this work have undoubtedly been beneficial but are impossible to estimate.

STEAM PLANT ECONOMIES

1. What number of kilowatt hours per barrel of fuel oil do you obtain from each or any of your steam plants, giving brief description of plant and load conditions?

San Joaquin Light & Power Corporation—At our Bakersfield steam plant the following equipment is installed:

- One 6250 kva. Allis-Chalmers 1800 r. p. m. turbo alternator, with Alberger surface condenser having 1-inch tubes.
- One 5000 kva. Allis-Chalmers 1800 r. p. m. turbo alternator, with Alberger surface condenser having ¾-inch tubes.
- Eight 600 horsepower Stirling boilers with super heaters, and Four 300 horsepower B. & W. boilers with super heaters. Pressure carried on boilers is 200 lbs.
- Two Alberger steam turbine driven, four-stage, centrifugal pumps.
- Two Cochrane open water heaters.
- One turbine driven exciter.
- One motor driven exciter.
- One Curtis steam turbine and Alberger three-propeller centrifugal pump; capacity approximately 16,000 gallons of water per minute, to handle circulating water.
- Two 30-inch centrifugal pumps, driven by tandem compound Harrisburg engine.
- One Alberger hotwell and one Alberger dry vacuum pump.

The erection of the plant was started in 1910 and completed in 1911.

With the 6250 kva. machine we obtain an output of approximately 220 kwh. per barrel of oil, and with the 5000 kva. machine we obtain an output of approximately 202 kwh. per barrel of oil.

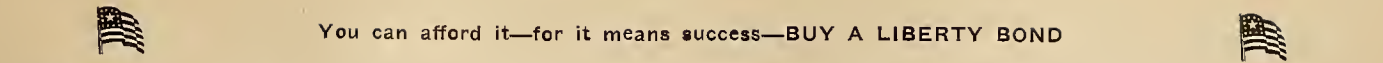
Great Western Power Company — Beach and Mason Steam Plant, San Francisco: 235 kwh. per barrel of oil, at 100 per cent load factor; one 10,000 kw. unit.

Oakland Steam Plant, Oakland: 230 kwh. per barrel of oil, at 100 per cent load factor; three 3500 kw. units.

Southern Sierras Power Company—Steam plant located at San Bernardino is equipped with seven Class O Stirling boilers, four steam driven Duplex Boiler Feed Pumps, two open feedwater heaters, one fuel oil pumping set; one 3000 kw. horizontal Parson's type steam turbo generator with direct connected exciter, one 5000 kw. horizontal Curtis type steam turbo generator with one M. G. set and one G. E. turbo exciter; each turbo being served by a surface condenser, hotwell pumps and circulating water pumps, in conjunction with two cooling towers, one being of the open type, the other enclosed.

The plant is operated under a variable load, from a maximum of 8000 kw. to a standby, or floating condition. Under the former, an average economy of 220 kwh. per barrel of oil is maintained. The latter condition is met with a consumption of 65 barrels of oil for 24 hours, while floating both units and all auxiliaries, or 27 barrels and 38 barrels, respectively, for turbos as mentioned. This includes the use of one burner under each of the two boilers and two or three other boilers floating on the header line, with the auxiliaries for the turbos in full operation, and also steam admitted to turbo blading, to maintain a temperature of 200 degrees F. while running in a vacuum; it being necessary to hold a temperature that will not be detrimental to turbo blading, by reason of the fact that when steam is not used the peripheral speed of blades generates heat in the vacuum that rises to a point that if continued will loosen the blades and even the bucket wheels from the shaft.

Sierra and San Francisco Power Company—Steam reserve station: three 9000 kw. Curtiss vertical turbines, 18 B. & W. boilers; total rated capacity, 10,400 horsepower. One



turbine floating on line until called on to pick up load to relieve hydro-electric station.

Load factor, 1917—11%.....kwh. per bbl., 152.5
Load factor, 1916— 5%.....kwh. per bbl., 143.3

Pacific Gas & Electric Company—At Station “A,” San Francisco, we often supply the entire load of San Francisco from Station “A” and in addition thereto supply energy to transmission. Again, we very often take large amounts from the transmission carrying either a light load at Station “A” or floating. When running under what might be termed good load conditions, we generate from 223 to 225 kwh. per barrel of oil. When floating or carrying a light load in connection with transmission delivered, of course the efficiency per barrel falls off.

Station “A” has turbine capacity of 42,000 kw. There are also installed in the station two 3500 kw. Union Iron Works triple expansion engines. The boiler plant has a rated capacity of 16,000 boiler horsepower. We have carried peak loads as high as 44,000.

San Diego Consolidated Gas & Electric Company—We obtain from 200 to 210 kwh. per barrel of oil, month in and month out. Maximum daily, about 220. As steam furnished an adjacent gas plant is a considerable portion of total generated, and steam flow meters are not overly dependable, exact monthly figures cannot be given; also lamp black burned further complicates computations. Above figures are correct within 5 kwh. per barrel.

Summary of conditions of operation: 12,270 kw. plant with 39.1 per cent annual load factor. Peak load 8800 kw. Boiler capacity 6694 horsepower. B. & W. water tube boilers, 160 pounds pressure, 75 degrees superheat. Principal generating units, two 4000 kw. and one 2000 kw. G. E. Curtis horizontal turbo generators, 3-phase, 2300 volts, 60 cycles.

Southern California Edison Company—For the economy of the Long Beach plant and an analysis of same, see paper on “Power Plant Losses,” by Mr. R. J. C. Wood, appearing as part of the convention proceedings, on page 344 of the Journal of Electricity, April 1, 1918.

2. Does it pay to test fuel oil when purchased for gravity, percentage of moisture and calorific value?

San Joaquin Light & Power Corporation—We constantly make test for moisture in the oil, and also make a gravity test. We have never had occasion to complain of the quality of the oil received from the oil company. We follow up the loading and unloading temperature, and have agreed with the oil company on a basis of charging which is mutually satisfactory.

Great Western Power Company—No, not under present contract conditions.

Southern Sierras Power Company—Fuel oil should always be tested for moisture and also for sulphur, especially when furnace indications show that there is an amount of sulphur present that is detrimental to the boiler tubing.

A calorific value test would prove beneficial when a heavy asphaltum base oil is encountered.

Sierra and San Francisco Power Company—Crude oil, yes. After it has gone through a still, no.

Pacific Gas & Electric Company—It pays to test fuel oil for gravity, percentage of moisture and calorific value, particularly if the contract for purchase of oil specifies the several values noted. Even if the contract does not specify these values it is well to know the various values in order to determine if the plant is operating efficiently and properly.

San Diego Consolidated Gas & Electric Company—We test fuel oil received for gravity and moisture and correct for temperature. Calorific value tested only occasionally. Rebates by reason of moisture content have paid many times

over for the equipment and expense of testing. Temperature correction is also of great importance.

3. Have you any definite data on the percentage of steam used in atomization of fuel oil?

San Joaquin Light & Power Corporation—We have never made any test at our plant as to quantity of steam required for atomizing. We use the oil burner manufactured by the Hammel Company. On many tests it has been shown that this burner uses from 2.5 per cent to 3 per cent of steam for atomizing.

Great Western Power Company—In Oakland Steam Plant, ½ of 1 per cent.

Southern Sierras Power Company — The following is from observation and notes during tests made:

The amount of steam used by oil burners for atomization will in the average plant be about 3 or 4 per cent of the total steam generated, but with good furnace conditions, clean burners and hot oil, the percentage of atomizing steam should be reduced to at least 1 per cent of the total generated.

It will be found that the percentage of steam for atomization will decrease as the boiler approaches 100 per cent overload. For example, a boiler operating at

11% overload will consume 2.3% of total steam
at 33% overload will consume 2.1% of total steam
at 38% overload will consume 2.02% of total steam
at 50% overload will consume 1.98% of total steam
at 71% overload will consume 1.84% of total steam
at 100% overload will consume 1.35% of total steam

Sierras and San Francisco Power Company—With good firing, 3 per cent; bad firing, indefinite.

Pacific Gas & Electric Company—We have installed on one of our boilers steam flow meters to determine the output from the boiler, as well as the amount of steam used in atomization of oil, and have found that when working the boiler at normal rating and 10 per cent above rating that the amount of steam is approximately 1 per cent of the total output of the boiler. With this information and with the methods pursued we have equipped the rest of the boilers with devices similar to this boiler under test and from our general experience we are of the opinion that it is possible to use as much as 5 per cent in atomization of oil without any better results.

When working the boiler at ratings of 15 per cent and over the quantity of steam will increase, the amount depending upon the furnace arrangement, size of chambers and on the draft.

San Diego Consolidated Gas & Electric Company — Recent tests to determine the quantity of steam required for atomization with Leahy oil burners, indicate as follows:

Steam Pressure at Burner	Lbs. of Steam per Burner per Hour
100	193½
90	179
70	147

Taking as an example a 520 horsepower boiler which will have three such burners with an average pressure of 100 pounds at the burner at full load, the total consumption for atomization is 3.23 per cent. Extrapolating the above results, consumption at 120 pounds would be 224 pounds of steam per hour. This is believed to be the conditions of operation at load and a half, which would indicate an atomization loss of 2.54 per cent at this load.

4. What has been your experience with heat insulation of boiler settings?

San Joaquin Light & Power Corporation—The boilers in this plant are insulated with the standard insulation used on Stirling boilers, and installed by Chas. C. Moore & Co. We have made no changes, and have added nothing to the heat insulation. We endeavor to keep this insulation up to 100 per cent efficiency.



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Southern Sierras Power Company—Have no data upon radiation losses in boiler settings.

Great Western Power Company—None.

Sierra and San Francisco Power Company—No experience.

Pacific Gas & Electric Company—On many of our old type of boilers we have used a brick of infusorial earth, which brick has been laid against the outside wall of the boiler and adjacent to that part of the furnace exposed to the greatest heat. We have noted that the temperature of this new outside wall is very much lower than the original wall. We have every reason to believe that this raised the boiler room efficiency, although we have no data to give as to the exact amount. We tried magnesia brick in place of the type mentioned above, but found that it would not stand up under the heat exposure.

San Diego Consolidated Gas & Electric Company—We have insulated some of the brick settings of our boilers with "J. M." Airtite Coating. Have no definite data, but believe some losses are prevented.

5. Do you use economizers, and if so, what feed water temperatures do you get ingoing and outgoing?

San Joaquin Light & Power Corporation—This plant is not equipped with economizers. We believe that if it were our output per barrel of oil would be materially increased.

Great Western Power Company—No.

Southern Sierras Power Company—Economizers are not installed in any of the steam plants of this company.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have economizers on one part of our boiler room. The incoming and outgoing temperatures are respectively, 120 to 200.

San Diego Consolidated Gas & Electric Company—We use no economizers.

6. Have you had any experience with automatic control of dampers, fuel oil supply, etc.? If so, with what results?

San Joaquin Light & Power Corporation—No.

Great Western Power Company—Limited application, but so far satisfactory. Merritt system.

Southern Sierras Power Company—From observations made would say that the present methods of automatic control could be improved upon, as the general results are not the most economical to be obtained.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have equipped six of our large B. & W. 680 horsepower boilers with the Merritt automatic oil feed and damper control. While this has not been installed long enough to give any definite information as to results, our short experience leads us to believe that it will be valuable as a fuel oil saver, particularly when operating in connection with the hydro-electric system, where the load variation makes it normally impossible for the fireman to control the oil flow as quickly as it can be done with this automatic system. Even when operating without tying in with the hydro-electric system we believe that with the Merritt system the oil and steam can be accurately adjusted for the load conditions desired, and when this has been done, do not have to rely upon the personality of the fireman each and every time the boiler load conditions change.

San Diego Consolidated Gas & Electric Company—We use automatic control of fuel oil to oil burners by the following means: A Mason spring type fan regulator is inserted in the steam line to the fuel oil pump. This regulator is actuated by boiler pressure acting on a diaphragm and is so adjusted that when in the closed position enough steam passes to the pump to maintain an oil pressure of 40 pounds at the burners. As the steam pressure falls off the regulator opens, consequently increasing the oil pressure. To avoid any chance of over pressure in the oil line, a Witte pressure gov-

ernor is used between the Mason regulator and the pump, so adjusted that the oil pressure cannot exceed 60 pounds.

With this outfit in good working order, steam can be maintained within plus or minus 2 pounds continuously, even with a rapidly fluctuating demand.

7. Have you modified your furnaces to improve efficiency, and if so, with what results?

San Joaquin Light & Power Corporation—The boilers are furnished with the Peabody furnace, marine type. No change has been made from the original design.

Great Western Power Company—Re-arrangement of checker work in Oakland Steam Plant improved combustion and efficiency between 1 and 2 per cent.

Southern Sierras Power Company—The Hammel oil furnaces have been modified with beneficial results, to the extent of increasing CO₂ readings an average of 40 per cent after a sixty day trial; all furnaces have been changed with the continued results for the past four years.

Sierra and San Francisco Power Company—Yes; too soon to state.

Pacific Gas & Electric Company—About three years ago we modified our furnaces in order to get a greater output from the plant. This modification has since helped us very materially when the price of oil increased. Special attention was paid to the air spaces in the grate, the idea being to bring the air in in such a way as to mix properly with the atomized oil, the result being a raise in efficiency and a greater output of steam from the boiler.

San Diego Consolidated Gas & Electric Company—We use Hammel type furnaces. Some changes have been made in the arrangement of air spaces with apparent increase of efficiency, but we can give no quantitative results.

8. Have you any fuel oil burners that you consider superior in the matter of efficiency? If so, give data.

San Joaquin Light & Power Corporation—From our experience we believe that the Hammel oil burner is equal to any on the market, is economical to maintain, and from the results of many tests, it has been proven that it is an efficient burner.

Great Western Power Company—No.

Southern Sierras Power Company—The Hammel fuel oil burner, as constructed for Stirling boilers, has given very good general results and we have not encountered any type which offers anything better.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have no fuel oil burner that we consider superior in the matter of efficiency. We use a modified Peabody burner, which is of the outside mixing type.

San Diego Consolidated Gas & Electric Company—After experimenting with a number of burners we have settled on the Leahy as being best suited to our needs.

9. To what extent does it pay to equip your fireroom with indicating or curve-drawing instruments, such as draft gages, flow meters, pyrometers, temperature recorders, CO₂ indicators, etc.?

San Joaquin Light & Power Corporation—So far, we have not equipped our plant with any instruments with the exception of a CO₂ recorder, and tests are made of the flue gases. Upon investigation of the results accomplished at other plants, we are of the opinion that boiler room should be fitted with instruments such as draft gages on each boiler, pyrometers and steam flow meters. An automatic system of draft and fuel control such as the Merritt system is also advisable. We have not gone to the expense of installing a fuel control system, as in the very near future we will be using natural gas under our boilers.

Great Western Power Company—Do not know.

Southern Sierras Power Company—Each boiler should



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be equipped with a steam flow meter first; this is the best investment of any single piece of boiler room apparatus and as important as a steam gage; CO₂ recorders are next in importance. The two above instruments, with a thermometer in the stack, or at the breaching connection, will tell the whole story. Other boiler specialties can be used, perhaps, to such an advantage as to make the investment worth while.

Sierra and San Francisco Power Company—No experience.

Pacific Gas & Electric Company—We believe it pays to equip the fire room with such instruments as draft gages, flow meters, pyrometers and temperature recorders, as with these instruments proper logs and records can be obtained in order to properly study plant efficiency and through the medium of these instruments leaks can be discovered. As to the CO₂ recorder, we have yet to find one that will work. We do believe in testing stack gases for CO₂ indication and have found that an Orsat set in the hands of an intelligent man will give far better results than any of the CO₂ automatic devices now on the market.

San Diego Consolidated Gas & Electric Company—Each boiler is equipped with a G. E. Co. Type F. S. 4 (indicating and recording) steam flow meter, and an Ellison draft gage. The flow meters, besides indicating directly thousands of pounds of steam per hour, also have special red points on the scale showing 100, 125, 150, 175 and 200 per cent load. There is a recording thermometer for stack temperatures and a recording CO₂ indicator. As a boiler room load indicator we use lamp banks which indicate automatically the number of valves open on each turbine. As the turbines have decidedly different efficiencies, this is to be preferred to a totalizing watt meter.

We believe these various devices aid the fireman materially in improving economy.

10. What is your opinion on steam versus electric auxiliaries, with special reference to heat balance, assuming the use of feed water heaters?

San Joaquin Light & Power Corporation—At our Bakersfield steam plant we use steam auxiliaries almost exclusively, as the steam is used to heat the feed water. In fact, when we are carrying a 6000 kw. load we hardly are able to raise the temperature of the feed water to as high a degree as we should. Our experience with electrically driven auxiliaries has not been very satisfactory. At the time when shorts and other troubles come on the line the speed and voltage of the generating units decrease and the capacity of the electrically driven auxiliaries also decreases, and at a time when they should be at their best.

Great Western Power Company—For standby stations we prefer electric auxiliaries, with excitation and feed water pumps in duplicate, one electric drive, the other steam.

Southern Sierras Power Company—We believe that with full use of feed water heaters, the steam auxiliary will prove the most economical.

Pacific Gas & Electric Company—As to steam versus electric auxiliaries, this is entirely a question of heat balance, which must be worked out individually for each and every plant; and further, must be watched carefully in each and every plant to see that the proper units (that is, steam or electric) are used during the time of light or heavy load conditions, as the heat balance, of course, changes with the variation of load on plant. It is safe to state, however, that where there is any quantity of feed water used it will pay to install steam driven auxiliaries in order to use the exhaust steam for feed water heating purposes.

San Diego Consolidated Gas & Electric Company—We prefer steam-driven auxiliaries as electric auxiliaries tend to intensify the results of a momentary shut-down. This is of course assuming that steam-driven auxiliaries do not yield

too great a quantity of steam to keep the feed water at 212 degrees, and in our plant the balance is such that there is ordinarily no surplus. In case of a surplus we would change from a steam-driven to a motor-driven exciter. We believe a flexible pair of auxiliaries of this type should always be available.

11. How high a vacuum do you carry, and is this measured at the turbine discharge or at the vacuum pump suction?

San Joaquin Light & Power Corporation—On turbine No. 3, on the 6250 kva., the vacuum carried is approximately 28.1 inch. On turbine No. 2, the vacuum carried is approximately 27.1 inch. During the hot summer months the vacuum on either machine is decreased approximately one inch. The vacuum is measured at the turbine discharge.

Great Western Power Company—Vacuum, 28-29 inch, at turbine discharge.

Southern Sierras Power Company—The vacuum usually carried when operating at full load will average 22.5 inch, except in hot summer weather, when it will not be more than 19.5 inch, this being in connection with cooling tower service. The vacuum is measured at the turbo exhaust.

Sierra and San Francisco Power Company—27½ in. at turbine discharge.

Pacific Gas & Electric Company—The vacuum will vary of course with the load on unit. At heavy loads we get about 28.4 inches of vacuum measured by mercury column. The vacuum we measure at the inlet to the condenser. If the vacuum is measured at the pump suction, same will be a little bit higher than at the point above mentioned.

San Diego Consolidated Gas & Electric Company—During the winter months we carry from 28½ in. to 29 in. with a maximum of 29.25. In summer from 28 in. to 28½ in. Vacuum is measured at turbine discharge to condenser.

12. Have you experimented with steam lanes, baffles, etc., in your condensers, and if so, with what results?

San Joaquin Light & Power Corporation—Our surface condensers are equipped with the standard top baffle. No experimenting has been done with these condensers.

Great Western Power Company—No.

Southern Sierras Power Company—Have no data upon the use of steam lanes and baffles in our condensers, more than the claims made by the manufacturers of dry plate type of surface condensers. These types contain a steam lane and diffusion plate to guide the exhaust steam through predetermined paths, so that the greatest amount of tube service possible is presented to the volume of the steam.

Sierra and San Francisco Power Company—Yes. No definite results as yet.

Pacific Gas & Electric Company—With the testing of our condensers we have not endeavored to experiment with steam lanes. We believe, however, that if a condenser is designed with due reference to steam lanes, baffles, etc., that very beneficial results can be obtained. This is shown in the design of what might be termed modern condensers of today where the design takes advantage of these points mentioned. Unless the condenser has been designed originally with this idea in mind, it is probable that not enough improvement can be made to justify the expense necessary to make the change.

San Diego Consolidated Gas & Electric Company—Our No. 2, 4000 kw. turbine was originally equipped with a condenser of 12,000 sq. ft. cooling surface. Tests were made to determine the vacuum in fourteen different locations, and a variation as great as 1.18 in. of mercury was found. A representative from the manufacturers then cut out some of the baffle plates and removed 170 tubes to better steam distribution, and after the change the variation did not exceed .5 in. Our No. 1, 4000 kw. turbine is equipped with a 10,000 sq. ft.



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condenser and gives as good results as No. 2, with 11,500 sq. ft.

13. Have you any data on improvement of vacuum to be obtained by increasing your circulating water supply, and relative costs and benefits to be derived?

San Joaquin Light & Power Corporation—We have a very abundant supply of circulating water, and have not been troubled on this score.

Great Western Power Company—No increase in vacuum by increasing water supply, from tests.

Southern Sierras Power Company—Have no data as to the cost of increasing circulating water supply to increase the vacuum, but from trials made would say that it is not worth the fuel to generate the steam for the circulating pump, the increased number of gallons of water pumped per minute would be considerable to make any change in the vacuum.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—There is no doubt that by increasing the quantity of circulating water supply, that is up to certain limits, that better vacuum may be obtained. This, however, is a question of heat balance, as the increase of the amount of circulating water put through the condenser may tend to give a little better vacuum, but at the same time reduce the temperature of the condensate to an uneconomical point, and it is again a question of watching the balance between the better vacuum and the lower temperature of the condensate. Where your plant may be located in such a way that the water has to be pumped to the condenser, the question of the cost of pumping and circulating water is also an important question.

San Diego Consolidated Gas & Electric Company — No data.

14. What economies of fuel or increase of efficiency have you been able to obtain in your steam plants by other means than those mentioned above, giving particulars?

San Joaquin Light & Power Corporation—Approximately one year after the plant had been in operation we installed Reilly multi-coil fuel oil heaters, and we estimate that the installation of these heaters increases the efficiency of the plant approximately 4 per cent.

Southern Sierras Power Company—Have nothing to offer upon this question.

Pacific Gas & Electric Company—In our steam plant we have endeavored by means of special devices to reduce the quantity of steam used in oil atomization; and to carefully watch the temperature of the ingoing and outgoing water used in the condensers, so as to adjust to a proper balance between vacuum and the temperature of the condensate. The installation of feed water heaters, together with the question of heat balance and steam versus electric auxiliaries is most important. Only by watching carefully all of the little details in a large plant can economical operation be obtained. We might add here that by taking tests on the condensate and on the feed water supply to the boilers to determine whether there are any leaks of salt water in the condensers, we have been able to get very good results in avoiding replacement of boiler tubes, together with reduced cost of having boilers down for cleaning, etc.

San Diego Consolidated Gas & Electric Company—The following additional apparatus and means of bettering plant economy have been utilized:

- (a) Have installed Vulcan Soot Blowers. Find them labor-saving, and undoubted producers of increased boiler efficiency.
- (b) Have installed Copes Feed Water Regulators.
- (c) Use a combination water and air, condenser tube cleaner which is a great labor-saver and does thorough work, thus improving vacuum. Can now afford to clean condensers oftener.
- (d) Have extended jetties into the bay to deep water, producing the following results: Better supply at times of low water; less silting up of channel and consequently less dredging required; condensers stay cleaner; discharge separated from intake at low tide so that cooler water is obtained.
- (e) Have given careful attention to steam pipe coverings and leakage of boiler settings.

15. What is the deterioration of steam turbines in the matter of steam economy due to wear or erosion of nozzles, buckets, intermediate and diaphragm plates, increase of clearance, etc?

San Joaquin Light and Power Corporation—There is no doubt that the steam economy of any turbine decreases as the wear or erosion of the nozzles and buckets increases. A turbine is guaranteed by the manufacturer to deliver a kilowatt hour with a certain steam consumption, but as the machine remains in service this consumption is increased. Whenever a machine is opened it is apparent to the eye that the buckets are worn. Buckets and nozzles no longer have the original sharp edges. Here and there a bucket or nozzle will be found broken, and experience with our plant shows that when the plant was new we obtained better economy from a barrel of oil than we do at the present time.

There is another feature connected with the use of steam turbines operating in parallel with hydro plants, such as on our own system, which should receive the careful attention of the coming meeting. This is the fact that the blading of turbines breaks down due to the heavy shorts which the machines are subjected to when operating in parallel with a high tension system. We have had the blading of our turbines break down on several occasions, and apparently no means of relief have been found to decrease the hazard. The installation of current limiting reactance coils would probably help the situation, but is there not some other method of protecting turbines against the tremendous strains they are subjected to? When a short comes on the line the throttle opens wide and the turbine blading fails.

This is a condition which we have all gone up against, and is one of the most serious situations existing, especially at this time when the shortage of water is so pronounced and we will all have to operate our steam plants to the utmost during the coming season.

Southern Sierras Power Company—The operation of No. 1 turbo has covered a period from June 3, 1912, to date, and has generated 7,499,700 kwh., and No. 2 turbo being in service since March, 1913, to date, and has generated 11,728,100 kwh. The stationary and moving blading of both turbos are in excellent condition and show no erosion whatsoever.

The principal cause of erosion seems to be in the water from which the steam is generated. If the water contains an average of 5 parts in 100,000 of free nitric or sulphuric acid or highly organic matter, it will start action on the turbo blading. These do not seem to do all of their work in the boiler, but pass over with the steam and attach the composition material of the blades. Salt water, or a stream containing organic matter used for condensing water, usually give more or less tube trouble, when the conditions become such that the tubes admit water to hot well of condenser. Boiler and turbo trouble may then be expected.

Scale formations may be removed from turbo blading by feeding a barrel of coal oil into the first stage while the machine is under slow rotation. The amount used should be upon a basis of one barrel per 5000 kw. turbo and usually cleans thoroughly, but care must be taken not to permit the oil to get into the hotwell piping or the heater, but must be discharged through the sewer.

Pacific Gas & Electric Company—We have not tested our turbines since installation to see whether the steam economy has decreased, but from an examination that we have made of the buckets at various times, practically no wear has been noticed.

San Diego Consolidated Gas & Electric Co.—We have found no evidence of deterioration of nozzles and blades in our turbines. Certain blades damaged in an accident seem to be giving way somewhat.



Your committee was unanimous in the belief that the latest design in the cap and stud class of suspension insulators should be subjected to "thermal



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fatigue" tests. Professor Ryan offered the facilities of the Electrical Engineering Department of the University for conducting such tests, and stated that he and Professor Clark would be able to direct this work along lines similar to those carried on in the past for the power companies.

It was decided to ask the leading porcelain manufacturing companies to donate 200 suspension units of the cap and stud type, 100 units complete with hardware, 100 units without hardware or cement, and 50 units with just the stud cemented in place.

SUSPENSION TYPE INSULATOR TESTS.														
SERIES	A	B	C	D	E	F	G	H	I	J	K	L	M	TOTAL
NO IN YARD	74	34	29	57	33	32	21	57	15	90	43	35	33	553
NO IN BASEMENT	0	33	28	0	33	31	0	0	0	0	0	0	32	157
INTERNAL DATES	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12	6/10 17/12
INTERVAL NO. OF DAYS	114	121	105	117	119	119	75	113	115	119	107	107	115	
FAILED SO CAP	0	9 13	9 10	0	10 13	1 3		0	0	1	3	7	5	58
FAILED UNDER SO CAP	0	1	0	0	0	1	0	0	0	0	0	0	1	6
FAILED UNDER SO DISC	1	0	0	0	0	0	1	0	0	0	1	1	0	4
FAILED TOTAL PER CENT. YARD	135	441	345	0	393	125	523	0	0	111	33	229	364	
FAILED TOTAL PER CENT. BASEMENT	1	30.4	32.1	1	36.4	6.45	1	1	1	1	1	1	18.7	

FOR ENDURANCE AS TO THE INCREASE OF NUMBER OF CRACKS IN THE COPS OF THE SO CAPS AND SO DISCS COVERED BY THE 10 SEC. SO TEST, SUCH TEST WAS REPEATED AT APPROPRIATELY SPACED INTERVALS, GIVING THE FIGURES RECORDED HEREWITH.

NO. OF TESTS	1	2	3	4	5	6	7	8	9	10	TOTAL
FAILED SO CAP	3	4	1	0	1	7	2	0	1	0	19
FAILED SO DISC	1	0	0	0	1	1	0	1	0	0	4

Table 2—A continuation of the tests noted above

This request has been made and four of the manufacturing companies have responded, namely: Jeffery Dewitt Company, Locke Insulator Manufacturing Company, Ohio Insulator Company, and The R. Thomas & Sons Company.

The committee planned to divide the insulators into two groups, each group containing both mounted and unmounted units. One group would be stored in the basement of one of the university buildings and held at practically a uniform temperature, while the other group would be divided into three classes:

- (1) Subjected to 2000 lbs. tension, strain conditions.
- (2) Subjected to 500 lbs. tension, normal suspension conditions.
- (3) No load, insulators with and without hardware.

All of these three classes would be subjected to rapid temperature cycles; with a few exceptions, these cycles would correspond to the daily temperature range met with in practice while occasionally they would be given a few cycles corresponding in range to that occurring in the yearly cycle. At intervals, all insulators, including both those stored at uniform temperature and those subjected to the temperature changes would be tested with 60 cycle spark-over-voltage to determine if any of the insulators were subject to "thermal fatigue" and if such was the case, to determine the rate. It is estimated we can obtain an equivalent of from 10 to 15 years normal ageing during one year of test.

Professor Ryan states the purpose of this test as follows:

- (a) "To develop as soon as practicable those makes of insulators that will have the lowest percentage of failures

under the cyclic temperature spark-over-voltage test, and which will, therefore, promise the highest durability as the matter is now understood.

- (b) "To develop at the same time the best procedure in making tests of this character."

To carry out this test work it will first be necessary to build a temporary wooden building at Stanford University to house the insulators and ventilating equipment, preliminary estimate of which has been presented. In addition to this, certain ventilating and heating equipment will be required before the work can commence, but it is hoped most of this can be obtained from the member companies for the duration of the tests. Under existing conditions, it would appear that the insulator problem is an extremely vital subject at the present time, as the insulators safeguard our hydro-electric energy, which is so important during the present fuel shortage. If we were able to build and insulate our transmission lines so as to almost eliminate failures, we could then at least shut down our standby steam plants, a majority if not all of the time, and not only reduce operating expense, but save fuel. Thus, your committee feels this "thermal fatigue" test on insulators should be carried out without delay.

SUBSTITUTE FOR CEDAR POLES

BY L. M. KLAUBER

(Although the substitution of Douglas fir for cedar poles, as discussed in the article on the next page, has not been in practice long enough to yet speak authoritatively of the results, it appears that one of the faults of the new wood will be an earlier deterioration. In view of this fact, the following method of reinforcement, as worked out by the San Diego Consolidated Gas & Electric Company, offers a suggestion of considerable timeliness and value.—The Editor.)

Methods of Reinforcing Poles at the Ground Line, as Practiced by the San Diego Company

Poles may be reinforced or protected at the ground line for one of two reasons: Either to strengthen a deteriorating pole or to prevent deterioration before it has begun. In the former case increased strength is essential and protection incidental; in the latter protection is primary.

The San Diego Consolidated Gas & Electric Company has used the Orr Pole Reinforcing system for many years with entire success. Large numbers of deteriorated poles have been reinforced, many of which were entirely rotted through at the ground line. Unquestioned savings result from the use of this system, particularly where poles carry heavy loads, and changing would entail a large outlay for labor. The Orr system is patented and as it is fully described in the trade press, no details need be given here.

The Orr system, while satisfactory in the first class of cases cited above, is too expensive for general use to prevent decay from starting. The San Diego Company is now experimenting with a process said to have been quite successful in Mexico. This consists in placing about the pole at the ground line a collar of rich sand and lime mortar, about 6 inches thick. As this is purely for protection, no reinforcing is used. This system has been in use too short a time to prove its efficiency. One difficulty which has developed in connection with this method is the fact that as the mortar sets slowly it tends to crack away from the pole, due to the vibration of the line in the wind. It then becomes necessary to fill the cracks with a mixture thin enough to pour.



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SUBSTITUTE FOR CEDAR POLES

BY L. M. KLAUBER

(Cedar poles had been growing scarce even in peace times, and with war demands in the lumber camps are now practically impossible to obtain. The forced use of substitutes has given rise to many problems in selection and treatment which only experiment and time can satisfactorily answer. Report on the progress of these experiments and results obtained thus far are presented below as part of the report of the Engineering Committee for the Pacific Coast Section; N. E. L. A., convention of May 9-11. The author is in charge of the electrical department with the San Diego Consolidated Gas & Electric Company. —The Editor.)

This sub-committee was appointed on September 8 last, to draft specifications for the purchase of timber for pole use as a substitute for cedar, with particular reference to Douglas fir. Owing to the fact that the other member of the committee was compelled to give up the work, due to the pressure of other business, our investigation has been by no means complete. However, as the writer's company has had some experience with Douglas fir poles during the past year, it is deemed advisable to present such data as have been accumulated.

Availability of Western Red Cedar and Douglas Fir

Western red cedar poles, which have for years formed the great bulk of the poles used for supply lines in this section, began to be scarce in the early spring of 1917. At first the difficulty appeared to be one of transportation; a considerable quantity of poles was said to be available at Washington and Oregon shipping points, but these could not be obtained owing to the lack of cars and lumber schooners. Gradually this supply was dissipated, and by fall it was practically impossible to secure cedar poles in Southern California, especially in the larger sizes. A few were brought down as deck loads on Douglas fir rafts, and some rafts arrived with cedar mixed in with the fir. In any case the supply was by no means equal to the demand and substitute poles were used in quantity during the last half year. The shortage first due to trans-

portation difficulties, as noted above, eventually developed into an actual material shortage, concerning which one well-known lumber dealer makes the following statement: "Owing to war conditions, and the action of the government in demanding that all the energies of the loggers be devoted to the production of spruce and Oregon pine for war purposes, it is practically impossible to secure cedar poles. In addition, practically all of the cedar timber lands tributary to transportation have been cut over, and even under normal conditions, cedar poles are constantly becoming harder to get. It is only a matter of time until it will be necessary to turn to a substitute." It is the opinion of lumbermen that the best substitute for cedar available on this coast is Douglas fir (or Oregon pine, as it is usually termed in this section), owing both to its availability and characteristics.

The enormous quantities of Douglas fir available in the Northwest are well known. It is estimated that 25.4 per cent of the entire standing timber supply of the United States is Douglas fir.* And since this timber is cut and shipped in great quantities for all structural purposes, it is nearly always available in our commercial centers.

In considering any timber for use as supply line poles, certain characteristics demand first consideration; these are, availability, cost, strength, and dura-

*Structural Timber Handbook on Pacific Coast Woods, O. P. M. Goss, page 6.



TREATING PLANT FOR FIR POLES

There is a cylindrical tank 8 feet in diameter and 10 feet 6 inches high, at the bottom of which is a steam radiator consisting of 116 feet of 2-inch pipe. Over the steam coil is a grid of channel iron upon which the butts of the poles rest. A steam derrick completes the outfit.



You must have poles enough to carry the load—BUY A LIBERTY BOND



TWISTING OF DOUGLAS FIR POLES

The tendency to spiral as displayed by Douglas fir poles is one of their chief drawbacks.

bility. Availability has been mentioned; cost is naturally closely related therewith since the timber found in the greatest quantities will usually be the cheapest in first cost, and is in this case. The strength of Douglas fir is well known. Says the U. S. Forest Service Bulletin No. 88: "Douglas fir may, perhaps, be considered as the most important of American woods. * * * As a structural timber it is not surpassed, and probably it is most widely used and known in this capacity." Therefore, in considering Douglas fir as a substitute for cedar, durability is the most important point, since it is the characteristic in which the former is lacking as compared with the latter.

One of the best posted men on poles in the business makes this statement: "The best substitute that can be had on this coast is Douglas fir, and we believe that while in their green state they would be subject to early rot at the ground line, still, after treating with creosote above the ground line, a Douglas fir pole will give very good satisfaction. We do not claim that it will last as long as cedar, but we are under the impression that if properly prepared and treated, its life would be 90 per cent as great as that of cedar."

We have not at hand any data from other companies which have employed Douglas fir in the past, as to the life which they have experienced, and our own installations are entirely too recent to justify any estimates as to probable life. It is, however, the universal belief of pole producers that to secure a reasonable life, an open tank treatment is essential, and that the brush treatment often used on cedar because of its low cost is practically worthless when applied to Douglas fir. Some authorities claim that a fir pole with an open tank treatment will outlast a cedar pole with a brush treatment.

While an open tank treated pole is higher in first cost than a brush treated pole, because of higher labor cost, fixed charges and greater quantity of preservative absorbed, the cost is by no means excessive, varying from 28 to 40 per cent of the first cost of the untreated pole in the yard.

A small treating plant which was used in treating several hundred Douglas fir poles varying in length from 50 to 75 feet is described as follows: There is a cylindrical steel tank 8 feet in diameter and 10 feet 6 inches high, at the bottom of which is placed a steam

radiator consisting of 116 feet of 2-inch pipe. Over the steam coil was placed a grid of channel iron upon which the butts of the poles rest. A steam derrick completes the outfit.

In operation, poles are placed in position and the tank is filled with the specified preservative 6 inches above the depth required by the particular size pole under treatment. Steam is then turned on and the liquid heated to boiling point, or about 220° F. and held at this temperature. The length of time the boiling continues depends entirely upon the character of the poles being treated. Dry poles are usually boiled for one hour; green poles, if necessitated by the exigencies of the construction program, are boiled from two to eight hours to insure thorough impregnation. After the boiling is complete, steam is turned off and the tank is allowed to cool to normal temperature, with the poles still immersed. Cooling in this manner insures the absorption of a maximum of preservative, although it is said that the penetration is not increased.

With reference to penetration, the following statements by the mill man in charge of the plant are of interest:

"Regarding the depth of penetration secured under the treating process, on cedar poles, the liquid usually penetrates to the depth of sap wood, running from $\frac{1}{2}$ to $\frac{3}{4}$ inch, and in some cases 1 inch. Poles that are thoroughly dry produce the most satisfactory results. This is especially true of Douglas fir, as poles of this wood are difficult to treat and secure an even penetration. The poles should be thoroughly dry, but in many that are furnished we do not have time to dry them before treatment. The density of the wood, the quantity of pitch and the case hardening on the outside of the pole during the drying, all affect the depth of penetration in fir. In some instances we have secured a penetration of one inch, and within a foot of this location on the same pole the penetration would be only $\frac{1}{4}$ inch.

"The sap wood on Douglas fir is as a rule much smaller than cedar and the same penetration cannot be secured as in cedar on this account. It is virtually impossible to treat the heartwood in any species. Our experiences agree with the experiments of the U. S. government."



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Other Characteristics of Douglas Fir

Other points which may be mentioned in connection with the use of Douglas fir poles are: Taper, weight, hardness, appearance, checking, and tendency to spiral.

The taper in Douglas fir poles is not so great as in cedar, and consequently modifications are required in the specifications covering this point. The natural taper of a cedar pole is about 1 inch in every 10 running feet, so that the average 45 foot cedar pole having an 8 inch top will have a 12 inch butt.* But in a Douglas fir pole the taper will only be about 1 inch in 15 feet, so that a 45 foot fir pole with an 8 inch top will have only a 10½ inch butt. As it is undesirable to reduce considerably, sizes at the ground line, particularly in dealing with a material more subject to decay than cedar, it becomes necessary to modify the specifications for tops as well as for circumference at the butt. It is therefore recommended that the Class A Douglas fir pole have a top not less than 31½ inches in circumference (10 inches in diameter), Class B, 28 inch, and Class C, 25 inch. We then have the following table of minimum dimensions, replacing in the Douglas fir specifications the standard table for Western red cedar. (Handbook of Overhead Line Construction, N. E. L. A., 1914, page 129.)

Minimum Dimensions of Poles In Inches

Length of Pole in Feet.	Classes		
	A	B	C
	(Minimum Top Circumference 31½ in.) Circumference 6 Ft. from Butt	(Minimum Top Circumference 28 in.) Circumference 6 Ft. from Butt	(Minimum Top Circumference 25 in.) Circumference 6 Ft. from Butt
30	37	33	30
35	38	34	31
40	39	35	32
45	40	36	33
50	41	37	34
55	42	38	35
60	43	40	37
65	44	41	38
70	45	42	39
75	46	43	40
80	47	44	41

It will be noted in comparing the above table with the cedar specification that, in spite of the increase in top dimensions the butt diameters are considerably less than cedar poles of corresponding grades, particularly in the larger sizes. This of course cannot be avoided unless top sizes are still further increased for each class of pole which, owing to cost, weight, appearance and other considerations, does not seem advisable. Companies using long poles for particularly heavy work should specify Class A poles having a certain proportion of 11 inch and even 12 inch tops. It may be remarked in passing that the cedar specification appears to be impractical in some details, with reference to the dimensions of poles secured on this Coast, being evidently based on a pole having a greater natural taper than we secure. We have heretofore in purchases been often compelled to modify the specifications, slightly reducing the required butt diameter in long Class A poles. The uses to which the several classes of poles are to be put, and the various proportions of each class to be specified in any order, do not, of course, come within the province of this report.

* "Butt" measurements are 6 feet from the butt.

Air seasoned Douglas fir is said to weigh 34 pounds per cubic foot, air seasoned cedar 33 pounds. The oven dry weights of the two woods are 29 pounds and 25 pounds, respectively. It is evident that Douglas fir poles of similar dimensions will be heavier than cedar, but long poles of similar class, being smaller at the butt, will be lighter than cedar when dried to the same condition.

Douglas fir poles are harder than cedar and more difficult to climb, especially after they have dried and "case hardened." This fact is universally noted by linemen. It is possible that if these poles come into general use, pole steps may again come into favor for certain classes of service.

As Douglas fir poles run straighter and slimmer than cedar, they make even better appearing poles. When trimmed and shaved they are generally dark red in color, whereas cedar is white, and they are consequently more conspicuous until thoroughly weathered. Although prohibited in the specifications, it is believed that poles used in city work, whether of cedar or fir, should be shaved.

Under similar conditions, Douglas fir seems to check less than cedar and the cracks do not run so deep. This difference, however, is not marked and varies greatly in individual cases.

Douglas fir poles, especially when set slightly green, have a decided and unpleasant tendency to spiral. Some rather bad examples are illustrated in the accompanying photographs. Almost every pole has more or less of a twist, as can be plainly seen by the checks, but some appear to untwist much more than others while drying and weathering. As the twist is, however, less than a complete turn in 20 feet, no change need be made in the cedar specification, this being the present limit. (Handbook on Overhead Line Construction, N. E. L. A., 1914, page 131.)

Conclusions

The standard specifications for the purchase of Western red cedar poles can be used in purchasing Douglas fir, except as to dimensions. The new table of dimensions given above is recommended.

It is not believed that Douglas fir poles will displace cedar as long as the latter are obtainable at a reasonable price. The inferiority of Douglas fir to cedar poles was thus summed up by a lineman: "They rot faster, you can't drive a spur into a dry one with an axe, you can't tell which end is the top, and they twist a line out of shape as they dry." Nevertheless, these difficulties can be overcome. Douglas fir is the best substitute for cedar to be procured on this coast, and the lumbermen predict that the cedar shortage will soon render their use general.

It has been suggested by one prominent lumberman that our association co-operate with the Forestry Department of the Federal Government and the principal pole producers, and study the pole question from the practical side, obtaining data as to the exact available supply of standing timber of the various species suitable for pole use. By co-operation of this nature, we will determine what kinds of poles can be secured and make our specifications accordingly.



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WAR SERVICE POWER PROBLEMS

(Conservation of power resources and conservation of energy are the subjects especially chosen for engineering discussion at the coming war service convention of the Pacific Coast Section, N. E. L. A. A series of valuable papers by experts in all phases of the problem are promised and interestingly analyzed in this report of the Engineering Committee.—The Editor.)

The violent world history of the past year has so reacted on American finance and industry as to result in the most distressing effect on public utilities in California and neighboring states, far removed as their activities may appear to be from the cause of the disturbance.

While their loads have grown at a higher rate than normal, the financing of betterments has become almost impossible, and even where possible, the cost of new equipment has become nearly prohibitive. In the rare cases where extensions can be financed; and it is felt that their cost can be afforded, the time required to get new equipment makes them unavailable for immediate needs. The engineers of the member companies of this section of the association have, therefore, been hard pressed during the past year to make two kilowatts grow where one grew before.

The cost of our fuel, crude petroleum or still residuum, has in general doubled during the past year. Labor costs have increased 25 to 50 per cent, and maintenance and repair materials have gone up in approximately the same proportion. The result has been a great increase in our costs per kilowatt hour, even where the bulk of the energy is obtained from hydraulic sources. In almost all such cases we depend upon steam to help carry our peaks and our load during the low water season. On account of war industrial demands our peaks have grown; irrigation for war-time food supply promises to greatly increase our load during the low water season, and even nature has been unkind to us in the Sierra Nevada mountains in reducing precipitation so that our run-off during the past winter has been unusually low, and our prospects for the next dry season are not encouraging.

For these reasons the engineers of your member companies have been forced during the past year to give operating economies much more intense study than heretofore.

It is then but natural that we should take as the subjects for the engineering discussion at the coming convention:

First: Conservation of power resources.

Second: Conservation of energy, whether in the form of the kilowatt hour, the elusive British thermal unit, or the corresponding hydraulic dimension.

Little more can be done than the obvious in the conservation of hydraulic power sources already in service. Where they are the limiting factors, generator capacities can often be increased by forced ventilation. In some cases where the penstocks, buckets and generators are ample, capacities can be increased by enlarging the nozzles. Other slight increases of capacity can be obtained by means outlined in the accompanying papers on the subject of increases in economy. The main opportunity for conservation in the development of new hydro-electric power sources

is the concentration (possibly of various interests) on the development of such sources as will give minimum cost per kilowatt consistent with output during dry seasons, short time of construction, nearness to market, etc. A paper will be presented for the consideration of the convention by Mr. F. H. Fowler, district engineer of the U. S. Forest Service, and consulting hydraulic engineer of the Federal Fuel Administration, which will analyze the principal hydraulic possibilities of the Sierra Nevada mountains along these lines.

In the southern part of the state a very large proportion of the total water power is now developed by one property, that of the Southern California Edison Company. One of the engineers of this concern, Mr. H. A. Barre, has prepared for the convention an analysis of the power situation in that territory from the viewpoint of conservation.

In central and northern California the water power resources are divided between a larger number of companies, among which conservation of existing facilities can best be obtained by interconnection, and a discussion of this has been prepared by Mr. J. P. Jollyman of the Pacific Gas and Electric Company.

Conservation of Energy

On account of the fact that practically all hydro-electric installations operate during their early years with a surplus of water, efficiency is given little consideration compared with the study of this feature in a steam plant. For this reason, opportunities for considerable increases of kilowatts per second foot often appear later, and under present conditions may become highly remunerative when steam generated energy can be saved thereby. Mr. E. C. Hutchinson has prepared for the convention a discussion of improvements in this respect that were found typical of average high head impulse wheel plants.

Data on experience along this line has been collected by the engineering committee in the form of answers to a questionnaire. This data as presented by Mr. J. P. Jollyman, on behalf of the Pacific Gas and Electric Company, is so comprehensive that the committee believes it will be to the advantage of those attending the convention to publish this matter together, instead of splitting up the answers and segregating them with those of other companies.

The questionnaire also covers losses and possible economies in transmission and distribution systems and in steam power plants. The data on transmission and distribution losses in the network of the Southern California Edison Company as prepared by Mr. R. E. Cunningham, is particularly commended to the convention. The losses in both the hydro-electric plants and the steam plants of the Southern California Edison Company have been analyzed for the convention in such a way by Mr. R. J. C. Wood that they also are



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presented as a whole and aside from the answers to queries in the questionnaire.

Sub-Committee Reports

The work carried out during the past year by the sub-committees appointed by the engineering committee may be summarized as follows:

Several sub-committees have been engaged in an advisory capacity on the preparation of codes of rules to be made effective by government commissions affecting the engineering work of the utilities in California. The engineering committee has appointed representatives on a board of twenty members charged by the State Industrial Accident Commission with the preparation of safety orders applying to electric power stations and substations. A brief report of this committee's work to date is included in the proceedings of the convention.

Another sub-committee has been assisting the California State Railroad Commission in the preparation of a safety code applicable to overhead line work. The work of this committee cannot be made public until acted upon by the commission.

Several members of the engineering committee have served during the last five years on the Joint Committee of Inductive Interference appointed by the California State Railroad Commission. This joint committee has completed its work and made its final report with recommendations for a new code of regulations to supersede General Order No. 39, but action on this work has not as yet been taken by the commission.

The work of the sub-committee appointed to investigate the deterioration of porcelain insulators has been greatly interfered with by priority rights of the government to the personnel engaged on this work. A brief report of this committee's work to date, with plans for the future, is separately presented.

Mr. R. C. Powell was appointed a sub-committee of one to collect all pertinent data on the subject of iron and steel conductors, and he has submitted a report which will not only save our engineers much time in getting the information required for such cases, but which adds to previous publications considerable original matter.

Standardization of pin type insulators and pins to avoid the necessity of stocking of several different insulators for the same service has been allotted to Messrs. L. M. Klauber and R. E. Cunningham, who have made recommendations to the convention for the standardization of these items.

On account of the growing scarcity of cedar poles, a sub-committee of one, Mr. L. M. Klauber, was appointed to collect data on the suitability of the timber available in the greatest quantity as a substitute, namely, Douglas fir. The report on this subject includes notes on butt treatment and reinforcing in case of decay.

Co-operation of Our Neighbors to the North

During the past year two members of the engineering committee of this section attended as the rep-

resentatives of the section the convention held in Spokane, in September, 1917, of the Northwest Electric Light and Power Association. These engineers reported a strong feeling of fellowship on the part of the Northwest section and a spirit in favor of closer co-operation between the two sections. As a result, the chairman of the engineering committee of this section was made a member of the corresponding section (known as the Hydro-electric and Technical Committee) of the Northwest association, and the chairman of that committee, Mr. George E. Quinan, was made a member of the engineering committee of this section.

No other change in the personnel of the engineering committee has occurred during the year, with the exception of the resignation of Mr. J. G. Scrugham, who has received a major's commission in the United States army and has gone into the Federal service.

In closing this report, the engineering committee wishes to express its appreciation of the work of the various engineers who have contributed to its proceedings.

REPORT OF REPRESENTATIVES ON THE PREPARATION OF SAFETY ORDERS

At the request of Mr. John R. Brownell, superintendent of safety of the Industrial Accident Commission of California, Messrs. J. A. Lighthipe, J. A. Koontz, M. C. McKay and J. P. Jollyman were appointed to represent the Pacific Coast Section of the N. E. L. A. on a committee of twenty members charged with preparing safety orders for electrical supply stations and equipment, which would be recommended to the Accident Commission as the basis for their orders on this subject.

At the first meeting of the committee, it was agreed that Part 1 of Circular 54 of the Bureau of Standards would be used as a guide for the proposed orders, and that the orders should be consistent with the Electrical Utilization Safety Orders issued by the Accident Commission and made effective January 1, 1917. J. P. Jollyman was chosen chairman of the committee and W. T. Bivins vice-chairman. Sub-committees were appointed among whom was divided the work of preparing the orders.

At the second meeting of the committee the reports of the sub-committees were received and the entire subject gone over. Most of the definitions and orders recommended by the sub-committees were approved. The balance were referred back to the sub-committees for revision. Among the matters referred back are some of the most important and most difficult. The sub-committees have done a considerable amount of work on the revisions and they hope to have their reports ready for consideration by the whole committee within a few weeks.

It appears probable that the orders which will be recommended will represent a material abridgement and revision of the Station section of the code proposed by the Bureau of Standards.



With joint operation, we can win — BUY A LIBERTY BOND



JOINT OPERATION OF POWER COMPANIES

BY J. P. JOLLYMAN

(The interconnection of power lines has been one of the methods of war service suggested and practiced for the war conservation of fuel resources throughout the West. In Central and Northern California a further step has been taken in the joint operation of power companies, which permits of even greater economies and exchanges. The developments which led up to the present situation, as well as possibilities of future co-operation are here discussed in an interesting way by the engineer in charge of electric construction with the Pacific Gas & Electric Company, San Francisco. The paper is submitted under the report of the Engineering Committee for discussion at the coming Pacific Coast Section, N. E. L. A. convention.—The Editor.)

During the latter part of 1917 the power companies of Central and Northern California began to feel in full the effects of the war. The cost of labor and supplies had increased; the cost of fuel oil had doubled, and interest rates had increased nearly 50 per cent. In fact it was generally understood that utility financing should not be undertaken, unless it was for extensions essential to the winning of the war.

These conditions naturally caused a greatly increased cost of operation and stopped all hydro-electric development. While the use of electric power may have been curtailed in some lines of industry by war conditions, its use in other lines was so greatly increased that the total power generated during 1917 showed a normal annual increase. At the close of the year there was every reason to believe that the same rate of growth might be expected during 1918.

That the increased cost of operation could not be met by the savings from such economies as had been made and could be made became evident, and the companies were forced to apply for authority to increase certain of their rates.

The abnormally low rainfall during the fall of 1917 and early winter of 1918 curtailed the output of the hydro-electric plants and made necessary the use of much additional steam power at a time when it was realized by all that a reduction in the rate of use of fuel oil was very important.

Realizing the conditions, the Railroad Commission made a study of the power situation in Central and Northern California to see what could be done to meet the emergency created by the war. A report on the engineering features of the problem was prepared under the direction of Mr. F. E. Hoar, gas and electric engineer of the commission, by Mr. G. S. Jacobs. This report presented an extensive study of the effect of combining the loads and facilities of the several power companies. Additional interconnections were suggested between the Northern California, Great Western and Pacific companies as a means of more fully utilizing their existing facilities and an extension of the system of the California-Oregon Power Company, to connect with the Northern California Company at Kennett, was proposed as a means of bringing additional hydro-electric power to the central part of the state.

To obtain a review of the power situation in the entire state the Railroad Commission initiated Case 1176, entitled: "In the matter of the construction and operation of the utilities during the emergency created by the war." Two committees of executives were appointed, one for Southern California, the other for

Northern California. The northern committee appointed a committee of engineers to work with the engineers of the commission on the technical problems involved. This engineering committee gave very careful study to all the suggestions made in the commission's report, and made a report of which the following is a brief summary:

1. The capacity of the existing interconnections (see Appendix I) between the several power companies was greater than had been generally supposed.

2. Under present load conditions no water would be spilled by the Sierra or Pacific companies at any time of the year. The Great Western would spill some water during the flood water season through the night hours, amounting to about 200,000 kwh. per day, although its peak load exceeds its hydro-electric capacity.

3. The only possibility of absorbing any of this surplus of hydro-electric energy was found in the Sierra company, which had spare forebay capacity, and whose load was such that they could receive about 60,000 kwh. per day and return it to the Pacific or Great Northern during the day and after the evening peak.

4. This exchange of power could be made over existing interconnections.

5. Other possible interconnections of the Great Western, Sierra and Pacific companies were given careful consideration, but were found inadvisable because of technical difficulties or inexpedient in view of the cost of the possible benefits.

6. By extending the lines of the California-Oregon Power Company, from Costella to Kennett, and raising their voltage to 66 kv. about 9000 kw. could be delivered to the Northern California Power Company continuously from the existing plants of the California-Oregon. This would give the Northern a surplus capacity which would enable it to deliver about 12,000 kw. at 80 per cent load factor, to the Pacific company, at Colusa, with certain addition to the transmission facilities of both companies. The plan considered involved the expenditure of approximately \$1,000,000 on the part of the three companies.

The California-Oregon has on hand an additional 12,500 kva. unit, which it can install in its Copco plant, and the Northern has possibilities for some additions to their facilities which would make possible another 12,000 kw. hydro. output in 1918. To deliver this additional power to the bay region would require a higher transmission voltage than 60 kv.

The plan for utilizing the surplus of the Great Western has been carried out and is now in operation.



After the war—depends on winning the war—BUY A LIBERTY BOND



The plans for the delivery of additional power from Northern California are under consideration. The interested parties are working on the engineering details and the question of finance.

Just before the commission received the reports of the committees for Southern and Northern California, the United States Fuel Administration called together the companies using steam power in the central district for the purpose of ascertaining what economies in the use of fuel oil could be obtained by the joint operation of the several plants. It was found that some of the steam plants could be shut down during the night if standby service could be given from the plants continued in operation. The existing interconnections were found to be adequate for this purpose. This plan has been put into effect so far as possible and is still in the process of evolution, as the best plants to run depend somewhat on the conditions of hydro power supply.

With the single exception of the California-Oregon Power Company, all the companies north of Fresno are now interconnected and are being operated, so far as the utilization of hydro-electric power and the saving of fuel oil are concerned, substantially as if under a single ownership. The transmission lines feeding into the bay district are kept loaded to their maximum capacity with hydro-electric power during the day and evening, but are unable to supply all the demand, and some steam power must be used. During the night these lines are kept quite fully loaded carrying the all night load and the power exchanged between the companies. The only interconnected companies having any hydro-electric power not fully utilized are the Great Western, who may have a little during the night, and the Northern California, who have a small surplus which cannot be utilized on account of the lack of sufficient transmission facilities from Chico into San Francisco, to which point the power must be taken if any further reduction of steam is to be effected.

The technical problems arising from this interconnected operation were quite fully discussed at a meeting of the San Francisco Section of the A. I. E. E., on February 28, 1918. Papers and discussions were contributed by Messrs. P. M. Downing, G. S. Jacobs, J. E. Woodbridge, W. G. B. Euler, and the writer.

APPENDIX "A"

Capacity of Existing Interconnections Between the Power Companies Operating In Central and Northern California

I—In the Bay Region:

*1. Pacific Gas and Electric Company, and } Great Western Power Co., at Oakland	5,000 kw. at 11,000 v. 12,000 kw. at 60,000 v.
2. Pacific Gas and Electric Company and Sierra and San Francisco Power Com- pany in San Francisco:	
(a) Bay Shore—Martin	10,000 kw. at 11,000 v.
(b) North Beach—Station F.....	15,000 kw. at 11,000 v.
(c) Martin—Bryant Street	4,000 kw. at 11,000 v.
(d) Martin—Geneva	4,000 kw. at 11,000 v.
3. Great Western Power Company and Sierra and San Francisco Power Com- pany:	
Tie line connecting steam plants....	9,000 kw. at 11,000 v.

II—In Other Parts of Northern and Central California:

*1. Pacific Gas and Electric Company and Snow Mountain Water and Power Com- pany at Santa Rosa.....	6,000 kw. at 60,000 v.
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*2. Pacific Gas and Electric Company and Western States Gas and Electric Com- pany at Folsom	3,000 kw. at 60,000 v.
*3. Great Western Power Company and Western States Gas and Electric Com- pany at Folsom	1,000 kw. at 22,000 v.
*4. Sierra and San Francisco Power Com- pany and Western States Gas and Elec- tric Company at Manteca.....	2,000 kw. at 30,000 v.
*5. Pacific Gas and Electric Company and Western States Gas and Electric Com- pany at Stockton	2,000 kw. at 2,200 v.
*6. Pacific Gas and Electric Company and Northern California Power Company at Chico	10,000 kw. at 60,000 v.
*7. Northern California Power Company and Western States Gas and Electric Com- pany at Junction City.....	3,000 kw. at 60,000 v.
*8. Pacific Gas and Electric Company and Coast Counties Gas and Electric Com- pany at Davenport	2,250 kw. at 24,000 v.
at Morgan Hill.....	3,000 kw. at 24,000 v.
*9. Sierra and San Francisco Power Com- pany and Utica Gold Mining Company at Angels Camp	1,000 kw. at 17,000 v.
10. There is at the present time under construction a connection between the Sierra and San Francisco Power Com- pany and the Coast Counties Gas and Electric Company at San Juan.....	3,000 kw. at 24,000 v.

*These interconnections are in daily service.

SOCIAL RECONSTRUCTION AFTER THE WAR

Theodore P. Shonts, president of the Interborough Rapid Transit Company, of New York, in a recent address made some constructive suggestions for the future. Mr. Shonts said, in part:

"All schools of political and social thought, even the most conservative, agree that epochal economic and social changes will result from the present war. We may, therefore, admit without debate that a return to pre-war conditions is impossible. The call now is for a program of constructive foresight.

"Social well-being undoubtedly demands an improvement in the general condition of the workers; and causes of social and economic injustice must be weeded out if the spread of propaganda, far more destructive than Socialism, is to be checked.

"Uncontrolled competition produces economic waste. Privately controlled industry avoids waste, but creates a tendency toward monopoly with swollen fortunes. On the other hand, governmental ownership and operation, in the light of experience, spells inefficiency. I believe, however, that the efficiency of private operation and the benefits of governmental control can be secured through a partnership between the government and private industry, thus leaving room for individual initiative with corresponding reward.

"In the past we have kept elaborate statistics on the causes of accidents, on the causes of rail and signal failures, and of all classes of material. But what fundamental statistics do we keep on the causes of failure and of the dissatisfaction of labor? Comparatively none, although of the two, labor (satisfied and efficient) is the more valuable asset.

A co-operative association of industry and labor would go far to relieve the community of perpetually recurring strife. The government, on the other hand, would be left free to discharge those functions which improve society as a whole."



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IMPROVEMENTS IN WATER WHEEL EFFICIENCY

BY E. C. HUTCHINSON

(Much of the old machinery of power plants which has proven inefficient in the light of modern installations may be raised to higher level of economy by the modification of its obsolete parts. A consideration of the changes possible through improvements in water wheel runners and water economizing nozzles is submitted in this paper as part of the Engineering Committee's report for the Del Monte convention of the Pacific Coast Section, N. E. L. A. The author, who is chief engineer with the Pelton Water Wheel Company, has had peculiarly favorable opportunity to study these problems in their actual operation.—The Editor.)

Many existing water power plants were built when economy was given comparatively little consideration; cost, reliability and governing being the main considerations, since surplus water was generally at hand. Even where economy was given attention comparable with that which it now deserves, many details of design for improving the efficiency were not as well understood as at present. In many such cases modifications can be made to improve the economy, and it has been my good fortune to make a study of a number of such cases.

The work has naturally fallen into three classifications:

1st. Improvement in power output by the installation of modern water wheel runners, the balance of the equipment remaining the same.

2nd. Improvement of power output through the decrease of water consumption by installation of the modern water economizing nozzle.

3rd. General improvement of the entire unit to the maximum degree by installing both modern water wheel runners and water economizing nozzles.

To best illustrate the possibilities under these three classifications, I have prepared two diagrams, both of which are based upon actual operating conditions taken from existing plants.

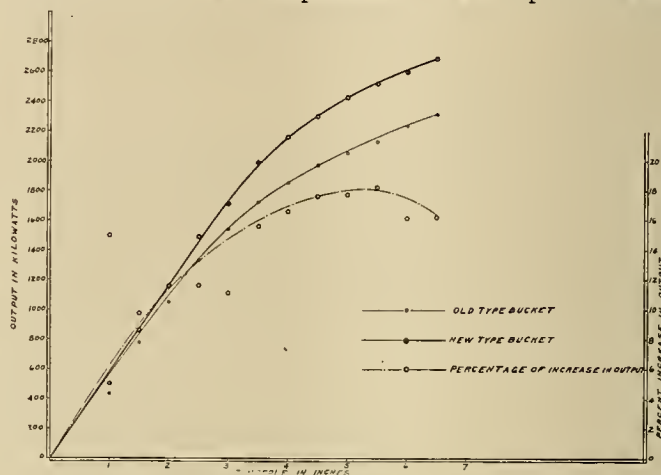
Diagram No. 1 shows characteristic curves of the results obtained by substituting a new and modern high efficiency form of bucket on an existing water wheel runner, the center of which is not modified. The reconstruction in this case consists of removing the old type buckets from the original runner center or body and mounting in their place the modern and more efficient form of bucket.

The diagram also shows clearly the percent of increase in power output obtained by the substitution of the modern bucket. While this diagram shows plainly the benefits obtained by the change in buckets, and is from this viewpoint very satisfactory, it does not, however, represent the extreme gain which can be obtained if there is an opportunity to modify the diameter of the complete water wheel runner and the number of buckets to provide the most favorable relations for any given set of conditions. To carry out the reconstruction in this form is generally productive of even better results; but is not always convenient, as it may mean pressing off of the shaft a number of rotating parts, which have long been set to their established positions. Those who have attempted the removal of parts that were pressed to place a number of years before, will recognize what this means in labor, and particularly in time.

There have at times been opportunities to alter the wheel diameter by turning down the wheel center

or body, while it still remains in place on the shaft. With some designs of equipment, this has proven very successful.

Again, conditions have been encountered in the reconstruction or modernizing of the older plants, which have made it impractical to attempt to install



INCREASE IN POWER OUTPUT

Characteristic of the results obtained by substituting a new and modern high efficiency form of bucket on an existing water wheel runner.—Diagram 1.

the modern form of bucket. This sometimes comes about through insufficient clearances between the extreme outer diameter of the rotating wheel and stationary parts of the wheel housing, nozzle or governing mechanism. The modern form of bucket is somewhat larger in all its dimensions than the older type and the major increase of size is in a direction radial with the wheel axis. As a result, it nearly always happens that a new set of buckets installed on an old wheel center or body makes the complete runner larger in diameter than before.

Chart No. 2 has been prepared to illustrate an average daily load curve in a large system carrying practically every class of commercial load. The curve is plotted to show:

The water consumption over an average period of 24 hours and at 100 per cent efficiency.

First above this load line is a broken line, which represents the water consumption at 100 per cent efficiency and when using a deflecting nozzle or rigid nozzle with a jet deflector.

In either case the nozzle is presumed to be fitted with a hand operated needle, by means of which the operator will be able to make hourly setting to provide for the flow of always a sufficient amount of water above the actual load line to insure reasonable speed regulation.



We have got to show that democracy is efficient to win—BUY A LIBERTY BOND



It will be recognized that with any form of nozzle, excepting that which is automatically controlled by the governor and consequently by the load upon the water wheel, a certain amount of water must necessarily be wasted continually from the nozzle, if there is to be a certainty of the water wheel unit being able to at once take care of any slight modification of load above the normal.

In the case of the automatic governor controlled needle nozzle, the amount of excess or regulation water is reduced to a minimum and is in the majority of plants not in excess of 5 per cent.

The heavy line following the curve of water consumption at 100 per cent efficiency, but somewhat above it, represents the water consumption over the daily load line, and assuming an 80 per cent average water wheel efficiency with water economizing and auxiliary nozzle equipment, assumed to be wasting 5 per cent of water.

The uppermost broken line of the diagram above the last named curve represents the water consumption in a plant which also has an average efficiency of 80 per cent, but has a deflecting nozzle or rigid nozzle and jet deflector with a hand operated needle set as closely to the load as possible once every hour.

The shaded portion between the curve of water consumption with the governor operated needle nozzle and the hand or separate motor operated needle nozzle represents the water loss resulting from the use of the old type equipment.

To better illustrate this water loss, at the bottom of the diagram an additional curve is shown. This water loss or surplus water consumption with which no useful work is performed, is given in percent over the daily load curve which has been taken for the general example. This represents an average water loss of approximately 12 per cent.

Assuming, therefore, the same classification as previously above outlined and giving consideration to the particular case which has been generally described, the following may be stated:

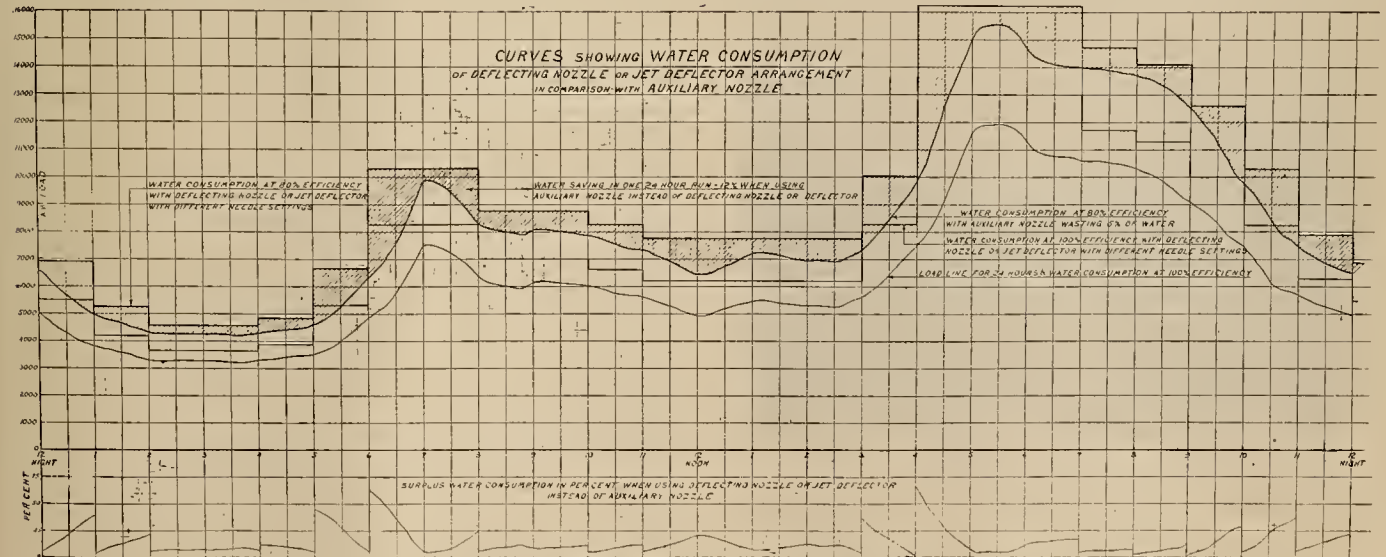
- 1st. The change of water wheel buckets resulted in an increased power output* (without an increase of water) of..... 18%
- 2nd. The installation of modern nozzle equipment, replacing the earlier form of deflecting nozzle or rigid nozzle with jet deflector, either of these being fitted with a hand or motor operated needle, will result in an average water saving over a 24 hour period, of..... 12%
- 3rd. The combination of cases numbered 1 and 2, which would result if the plant were improved by furnishing both modern water wheel runner and modern water economizing nozzle, is practically 32%
Or almost one-third better efficiency than that at which the plant was operating prior to the change.

The example which has been taken for this discussion is not by any means extreme, but represents no more than an average proposition, conservatively considered.

It is of course impossible to state, before an investigation, what results can be obtained in any particular plant.

In the above discussion, consideration has been given essentially to the possibilities for improvements of power output in impulse or tangential water wheel installations. No consideration has been given to such economies of operation as fall distinctly within the sphere of the plant operator or load dispatcher.

There are of course a great number of ways in which economy can be obtained in any large system of plants, when linked together, as of course there are then opportunities for operating the individual plants at their known points of maximum efficiency and using only those plants which are most efficient at low or fractional loads for regulating. In many plants which are but portions of a large operating system, an investigation along these lines has frequently developed the opportunity to install high efficiency water wheel units of either the impulse or reaction type and having such characteristics as to provide highest efficiency at their



AVERAGE DAILY LOAD CURVE
Water consumption with the use of a deflecting nozzle or a jet deflector arrangement in comparison with an auxiliary nozzle.—Diagram 2.



Don't fail when the pressure comes — BUY A LIBERTY BOND



point of continuous operation, without respect to their efficiency at lower or fractional loads.

Generally speaking, the impulse or tangential water wheel has a much flatter efficiency curve characteristic than the reaction turbine; yet great economy has been effected under certain conditions by the replacement of some impulse wheels with reaction turbines, which will deliver a higher efficiency at a point of continuous load output.

On the other hand, there have also been instances (not a few in fact) where because of the great variation of load and the much better fractional load efficiencies to be obtained by impulse water wheels of the multiple runner, duplex nozzle type, replacements of reaction turbines have been effected in a field which, under ordinary conditions, would appear to lie altogether beyond the proper bounds of impulse or tangential water wheel construction.

Furthermore, a very considerable improvement in power output has been obtained by installing turbines of the modern reaction type to replace turbines of the older and earlier forms of design. Under present conditions, however, there is no question that the water wheel installations of the impulse or tangential type offer the best opportunity for increased power output, with the least additional expense to purchaser, as most forms of turbine construction do not permit of modification by the substitution or replacement of detail parts for the purpose of increasing efficiency and power output from the same amount of water. The result is that most reaction turbine improvements are made by installing complete new units.

THE CALAVERAS DAM CATASTROPHE

On Sunday, March 24th, the up-stream face of the Calaveras dam, now under construction by the Spring Valley Water Company, sloughed off and slid into the reservoir. The dam has a broad core built by the hydraulic fill method and is to have an ultimate height of 240 feet. It had been carried up to a crest height of about 200 feet, at which elevation there had been a cessation of the hydraulic work to give the material already deposited time to solidify.



THE CALAVERAS DAM

The dam as it was, showing the gate tower which was pushed over by the sliding earth

As described in the Journal of Electricity in the issue of February 15, 1917, dry clay, sand and gravel

are taken from the western side of the canyon and dumped on the upper and lower faces of the dam so that the width of dry material from the up-stream side toward the center is about one-third this distance, while on the down-stream side it is one-half the distance from edge to center. The remaining central portion of the dam, representing about 60 per cent of its width, is hydraulicked in from the surrounding hills. The material deposited as hydraulic fill ran about 50



THE DAM AFTER THE BREAK

This shows a view of the dam from the opposite side after the break. The up-stream face, whose crest extended from the eminence indicated in the rear of the picture to the observer, has entirely given away. The line of the former slope is shown by the embankment in the rear.

per cent clay and 50 per cent sand and gravel. There is a large concrete culvert under the dam, resting on rock foundation and located to the west of the creek channel. The gate tower rose from the upper end of this culvert. The accident occurred about half-past seven o'clock in the morning. There was no preliminary warning. The tower, a well-reinforced structure, was torn from its connection with the culvert by the sliding earth and overturned. It is not known where the rupture between the culvert and the tower occurred, as inspection has been impossible.

The tower is entirely out of sight, being covered with a blanket of earth and the water in the reservoir—this being the reservoir's second season of use. The maximum depth of water now in the reservoir is about 55 feet. The up-stream dry face of the dam seems to have been carried into the reservoir on the moving central mass of the dam, traveling a somewhat greater distance at the easterly end of the structure than at the westerly end. A small amount of the down-stream dry fill at the top of the dam was included in the movement. The upper end of the culvert is choked with earth and rock. A new shaft on solid ground, with tunnel to the culvert, has already been started to afford means of draining the reservoir. No estimate has yet been made of the amount of material which was in motion. That it was large will appear from the photograph herewith presented and from the fact that the total amount of material, already placed in the dam, had been 2,800,000 cubic yards.



Bake ovens for the boys cost money—BUY A LIBERTY BOND



INDUSTRIAL ELECTRIC HEATING

BY E. A. HOLLOWAY (CHAIRMAN), J. B. BLACK, E. B. WALTHALL

(Electric heating is finding daily a wider application. A birdseye view of the present situation, with much that suggests further opportunities is offered by the data here presented. A valuable bibliography and a plan for continuing the work are further included in the report, which forms part of the general Commercial Committee's data for the Pacific Coast Section, N. E. L. A., convention. The authors are all in authority in the commercial and sales departments of their respective companies.—The Editor.)

It was the intention of this committee to gather together as much available data on industrial heating from companies throughout the Pacific Coast Section as possible in the short time allotted. We have succeeded in collecting some very valuable information from the member companies, but we feel that this work is so important that it should be carried on throughout the entire year to get the best results.

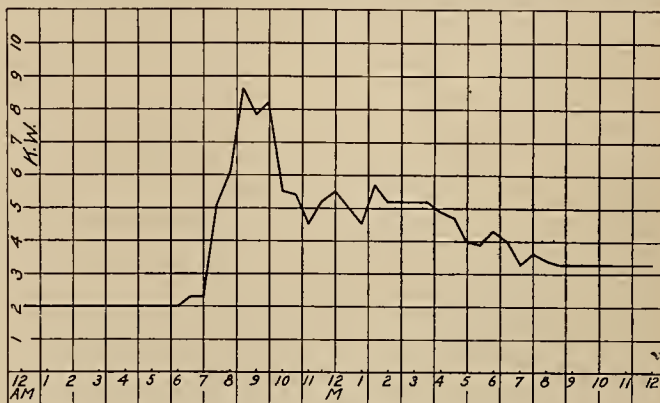
The committee desires to make the following recommendation to the Commercial Committee of the Pacific Coast Section:

1st. That an Industrial Heating Committee be appointed at once after the April meeting to carry out the work of compiling data on industrial heating installations on the Pacific Coast.

2nd. That this committee collect such data and file it with the secretary of the Pacific Coast Section for use by member companies.

3rd. That as much of the data collected as possible be published in electrical papers.

Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.
General discussion—More uniform results in cooking. Less shrinkage of food.

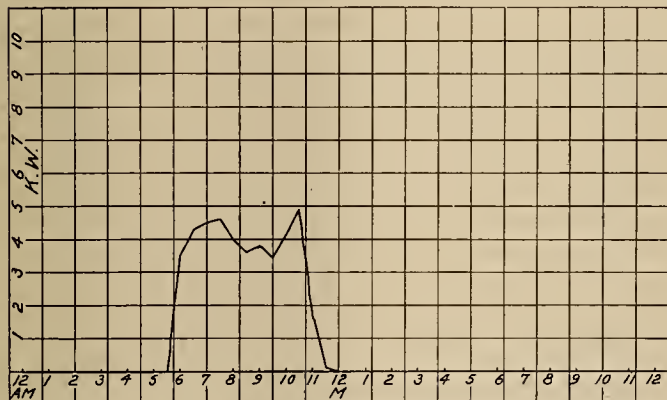


COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT
HOCKHEIMER & CO., BAKERSFIELD

Sum of all highest daily peaks, 58.0 kw. Average peak, 9.6 kw.
Equipment installed: One Hughes bake oven, 10 kw.

Data on Electric Bake Oven

Name of firm—Hockheimer & Company.
Location—Bakersfield, California.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.
Construction of apparatus—Metal, tile decks, mineral wool packing, and open type units wound on asbestos coil.
Size—35 x 45 x 73 in. high.
Shape—Rectangular as per above dimensions.
Watts connected load—Ten kilowatts.
Control—3-heat control on each unit.
Number of heating units—Five.
Temperature to be maintained—350 to 600 degrees Fahrenheit.
Cycle of heating operations—Used 6 days per week.
Weight of material heated—No data available.
How material is handled—By hand.
Duration of process—From 20 to 40 minutes.
Operation—Hand controlled, non-automatic.
Maximum demand—Ten kilowatts.
Number of hours operated per day—Nine hours.
Load factor—1.6 per cent.
Diversity factor—See attached load curve, which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—1212 kilowatt hours.
Advantages over other fuels—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters.
Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT
IDEAL CAFETERIA, FRESNO

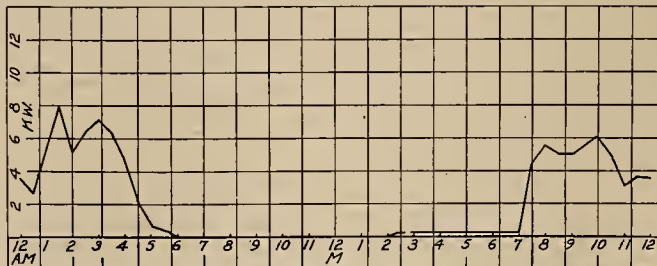
Sum of all highest daily peaks, 33 kw.
Average peak, 5.5 kw.

Equipment installed: One Hughes bake oven..... 5 kw.
One two-burner hot plate..... 2.6 kw.

Total 7.6 kw.

Data on Electric Bake Oven

Name of Firm—Ideal Cafeteria.
Location—Fresno.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.
Construction of apparatus—Metal, tile decks, mineral wool packing and open type units wound on asbestos coil.
Size—34 x 24 x 66 in. high.
Shape—Rectangular as per dimensions above.
Watts connected load—Five kilowatts.
Control—3-heat control on each unit.
Number of heating units—Four.
Temperature to be maintained—350 degrees to 600 degrees Fahrenheit.
Cycle of heating operations—Oven is operated from 6 a. m. to 11 a. m. daily, 7 days per week.
Duration of process—From 20 minutes to 50 minutes.
Maximum demand—Five kilowatts.
Number of hours operated per day—Five hours.
Load factor—1.22 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—440 kilowatt hours.
Amount of work done per month—Baking for 800 meals per day.
Advantages over other fuel—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT
VALLEY GRILL, FRESNO

Sum of all highest daily peaks, 55.4 kw. Average peak, 9.5 kw.
Equipment installed: One Hughes bake oven, 10 kw. capacity.

Data on Electric Bake Oven

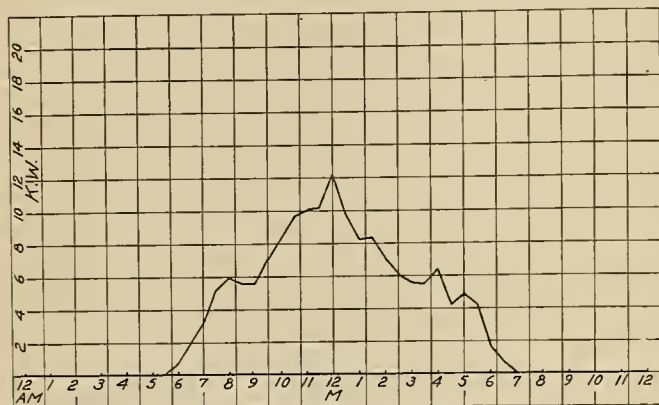
Name of firm—Valley Grill.
Location—Fresno.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.



It's our business to provide the current to keep things running—BUY A LIBERTY BOND



Construction of apparatus—Metal, tile decks, mineral wool packing, and open type units wound on asbestos coil.
Size—35 x 45 x 73 in. high.
Shape—Rectangular as per dimensions above.
Watts connected load—Ten kilowatts.
Control—All units have 3-heat control with snap switches.
Number of heating units—Five.
Temperature to be maintained—350 to 600 degrees Fahrenheit.
Cycle of heating operations—From 8 p. m. to 4:30 a. m. daily.
Weight of material heated—All pastry for about 1500 meals per day.
Duration of process—From 20 to 40 minutes.
Operation—By hand.
Maximum demand—Ten kilowatts.
Number of hours operated per day—Eight and one-half hours.
Load factor—2.1 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—1554 kilowatt hours.
Amount of work done per month—All pastry for 1500 people daily.
Advantages over other fuel—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT LIBERTY MARKET, FRESNO

Sum of all highest daily peaks, 81.6 kw.
 Average peak, 13.6 kw.

Equipment installed: One General Electric range.....11 kw.
 One Ruttenger range 5 kw.
 One Hughes bake oven.....10 kw.

Total26 kw.

General discussion—More uniform results in cooking. Less shrinkage of food.

Data on Industrial Electrical Cooking Installation in a Delicatessen
Name of firm—Liberty Market.
Location—Fresno.

Name of appliances—2 ranges and 1 bake oven.
Manufacturer of appliance—1 range made by the Ruttenger Co., 1 range by the Rathbone-Sard Co., and the bake oven by the Hughes Electric Heating Co.

Construction of apparatus—Rathbone-Sard range entirely of metal enclosed type burners. Ruttenger range, metal and terra cotta open type burner. Hughes bake oven built of metal lined inside with metal walls insulated with mineral wool. Heating units of the open coil type wound on asbestos tubes. Oven equipped with tile decks.

Size—Rathbone-Sard range, 28 x 54 x 52 in. high. Ruttenger range, 29 x 35 x 51 in. high. Hughes bake oven, 35 x 45 x 73 in. high.

Shape—Rathbone-Sard range cabinet type, 4 burners and 2 ovens. Ruttenger range, 3-burner domestic range, oven underneath. Hughes bake oven, rectangular in shape as per dimensions above.

Watts connected load—Rathbone-Sard range, 11 kilowatts. Ruttenger range, 5 kilowatts. Hughes bake oven, 10 kilowatts.

Control—All equipment has each unit equipped with 3-heat switches and control.

Number of heating units—Rathbone-Sard range, 8. Ruttenger range, 5. Hughes bake oven, 5.

Temperature to be maintained—The temperature on all of the above equipment varies from 250 to 600 degrees Fahrenheit.

Cycle of heating operations—Rathbone-Sard range used in delicatessen operates continuously from 7 a. m. to 5:30 p. m. Ruttenger range used for baking Parker House rolls operates from 8 a. m. to 5 p. m. Hughes bake oven used for fancy pastry, operates from 8 a. m. to 5 p. m.

Maximum demand—Twelve kilowatts on total installation.

Number of hours operated per day—Eleven hours.

Load factor—1.2 per cent.

Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).

Number of kilowatt hours per month—930 kilowatt hours.

Advantages over other fuels—Absence of heat, smoke, fumes, dirt and dust. Ease of control. Better quality of work. More reliable in the exactness of results.

General Discussion—This equipment is installed in an open market where the public can witness the meats and pastry during their cooking process, which is a decided advertising value to the consumer, and the advantages of electric cooking in general apply to this installation.

Data on Bake Oven Installation

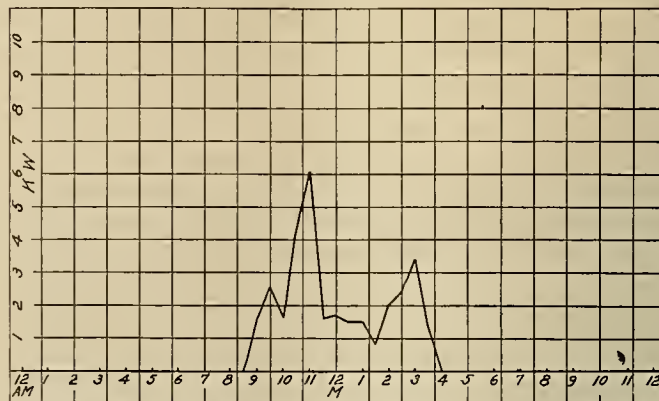
Name of firm—Universal Packing Company.

Location—Fresno.

Name of appliance—Bake oven.

Name of manufacturer—Hughes Electric Heating Company.

Construction of apparatus—Metal walls, mineral wool insulation between the walls, tile decks, open type heating units wound on asbestos tubes.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT UNIVERSAL PACKING CO., FRESNO

Sum of all highest daily peaks, 56.4 kw.
 Average peak, 9.4 kw.

Equipment installed: One Hughes bake oven, 15 kw.

Size—35 x 45 x 69 in. high.

Shape—Rectangular as per above dimensions.

Watts connected load—15 kilowatts.

Control—3-heat control on each unit.

Number of heating units—Four.

Temperature to be maintained—500 to 600 degrees Fahrenheit.

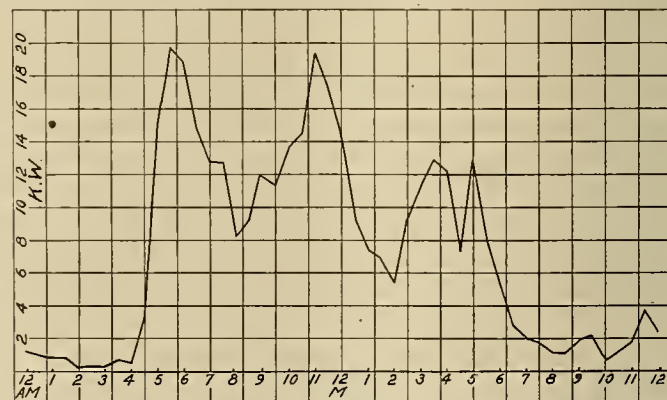
Cycle of heating operations—Used for about 2 hours, 3 days each week.

Duration of process—Above 50 minutes.

Maximum demand—15 kilowatts.

Number of hours operated per day—Average 1 hour per day.

Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT BURNETT SANITARIUM, FRESNO

Sum of all highest daily peaks, 140 kw.
 Average daily peak, 23.3 kw.

Equipment installed: General Electric hotel type range...15.5 kw.
 Simplex hot plate 4 kw.
 3 Hughes hot plates (3.3 kw. each)... 9.9 kw.
 Hughes hotel type toaster..... 3 kw.
 General Electric domestic range... 8 kw.

Total40.4 kw.

Advantages over other fuels—Ease of control. Cost of fuel in direction proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.

General discussion—More uniform results in cooking. Less shrinkage of food.

Data on Electric Cooking in a Sanitarium

Name of firm—Burnett Sanitarium.

Location—Fresno.

Name of appliances—1 hotel type range; 1 domestic range; 1 hotel type toaster; 4 hotplates.

Manufacturer of appliances—Hotel type range and domestic range made by General Electric; 3 hotplates and hotel type toaster made by Hughes Electric Heating Company; 1 hotplate made by Simplex Electric Heating Company.



Don't give the Kaiser a half-baked bomb—BUY A LIBERTY BOND



Construction of apparatus—General Electric and Simplex equipment of enclosed type units. Hughes equipment open type units. Made of metal and terra cotta brick. Hotel type toaster made entirely of metal.

Size—General Electric hotel type range, 61 in. high, 48 in. wide, 39½ in. deep. Hughes toaster, 22½ in. wide, 24 in. deep, 15 in. high. General Electric domestic range, floor space 24 x 45½ in., height 57½ in. Simplex hotplates 14 x 14 x 6 in. Hughes hotplate, 14 x 32½ x 6½ in. high.

Shape—General Electric hotel type range, rectangular. Hotplates of usual hotplate construction. Toaster, square. Domestic range of usual cabinet type, oven on the side.

Watts connected load—Hotel type range, 15½ kilowatts. Domestic range, 8 kilowatts; 3 Hughes hotplates, 3.3 kilowatts each. Simplex hotplate, 4 kilowatts. Hotel type toaster, 3 kilowatts.

Control—All units have 3-heat control except those on the hotel type range, which is equipped with 2-heat control on all oven units and single heat control on top hotplates.

Number of heating units—Hotel type range has 16, domestic range, 6. Hughes hotel type toaster, 2. Hughes hotplates, 3 (1 each). Simplex hotplate, 1.

Temperature maintained—Temperature on all above units varies from 250 to 600 degrees.

Cycle of heating operations—Hotel type range is used constantly from 5 a. m. to 6 p. m. Hotplates, domestic range and toaster used from 1½ hours to 2 hours during each meal.

Operation—All equipment hand controlled.

Maximum demand—Twenty kilowatts.

Number of hours operated per day—Main range operated about 12 hours a day. Hotplate equipment installed in diet kitchen operated about 5 hours a day.

Load factor—6.2 per cent.

Diversity factor—See attached load curve which is a composite curve for six days (also connected load).

Number of kilowatt hours per month—4500 kilowatt hours per month.

Amount of work done per month—Entire cooking for about 200 people.

Number of kilowatts per unit of product—No data available.

Advantages over other fuel—Absence of heat, smoke, fumes, dirt and dust. Ease of control. Better quality of work. More reliable in the exactness of results.

General discussion—In the first place, the hospitals equipped with electric cooking equipment are assisting materially in the conservation of our fuel supply where the electric energy is generated by water power. The advertising feature is an advantage to the institution. Meats cooked in the electric ovens shrink less, retain more of their nutritious juices, and enable the cook or the chef to turn out their work with less worry and fatigue.

Data on Industrial Electrical Cooking in a Hotel

Name of firm—Weit's Hotel.

Location—Wasco, California.

Name of appliance—1 range, 1 frying griddle, 1 electric water heater.

Name of manufacturer—Range is a General Electric, Type K-65. Frying griddle, Hughes Electric Heating Company. 3 kilowatt water heater, Automatic Electric Faucet Company.

Construction of apparatus—General Electric, enclosed type units throughout. Frying griddle, enclosed type. Water heater, electro-lytic circulating automatic type installed on 30-gallon tank.

Size—General Electric range, 28¼ x 62 x 65 in. high. Frying griddle, 20 x 20 x 10 in. high. Water heater, 6½ x 4 x 11 in. high.

Shape—General Electric, 6 burners, 2 ovens, cabinet type. Frying griddle, square as per dimensions above. Water heater, tubular as per dimensions above.

Watts connected load—Range, 14 kilowatts. Frying griddle, 3 kilowatts. Water heater, 3 kilowatts.

Control—All range units and griddle units have 3-heat control switches. Water heater is controlled by an automatic thermal switch.

Number of heating units—The range has 10; frying griddle, 1; water heater, 1.

Temperature to be maintained—Range, 250 to 600 degrees; frying griddle, 250 to 600 degrees; water heater, about 190 degrees, Fahrenheit.

Cycle of heating operations—Range is used 3 times a day for about 3 hours each. The frying griddle also used 3 times a day, 3 hours each. Water heater works intermittently, due to the automatic control, for about 12 hours a day.

Weight of material heated—Range and frying griddle, food for about 35 people 3 meals a day. All hot water necessary for kitchen use heated by the water heater. No data as to number of gallons.

How material is handled—By hand.

Operation—By hand, except water heater, which is automatic.

Maximum demand—Ten kilowatts.

Number of hours operated per day—9 to 12 hours.

Load factor—2.8 per cent.

Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).

Kilowatt hours per month—2150.

Amount of work done per month—The cooking of about 3000 meals.

Number of kilowatts per unit of product—Seven-tenths kilowatt per meal.

Advantages over other fuels—In this locality much cheaper; is also cleaner, quicker, more reliable, and more satisfactory from every standpoint.

General discussion—More uniform results in cooking.

Data on Electric Spot Welder

Name of firm—Rudgear, Mearle & Co.

Location—198 Bay street, San Francisco, Cal.

Name of appliance—Spot welder.

Manufacturer of appliance—Toledo Electric Welding Co.

Size—5 ft. high by 5 ft. long.

Shape—Like an ordinary lathe.

Watts connected load—Thirteen kilowatts.

Control—Hand control.

Number of heating units—Three (adjusted for different weights of material).

Temperature maintained—1500 degrees C. 2700 degrees F.

Cycle of heating operation—

Weight of material heated—About one ounce.

How material is handled—Tubes set in vise by hand.

Duration of process—About 5 seconds to each weld.

Operation—Lowering welding pin by hand (extremely simple).

Maximum demand—Thirteen kilowatts.

Number of hours operated per day—Nine hours per day.

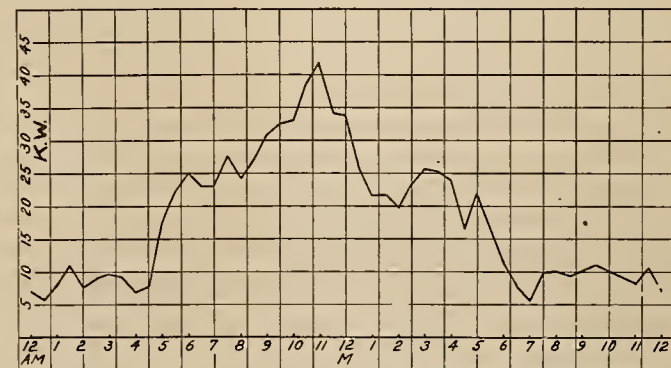
Load factor—4.6 per cent.

Diversity factor—None.

Number of kilowatts per month—405 kwh.

Amount of work done per month—Caps welded on about 5000 tubes per month.

Number of kilowatts per unit of product—81 watts per tube.



COMPOSITE CURVE MADE FROM SIX OTHER COMPOSITE CURVES OF COMMERCIAL COOKING INSTALLATIONS

The sum of the average peaks from the above six curves, 70.9 kw.

Hockheimer & Company, Bakersfield.....	10 kw.
Burnett Sanitarium, Fresno.....	40.4 kw.
Universal Packing Company, Fresno.....	15 kw.
Ideal Cafeteria, Fresno.....	7.6 kw.
Liberty Market, Fresno.....	26 kw.
Valley Grill, Fresno.....	10 kw.

Total.....109 kw.

Advantages over other fuel—Advantage over acetylene welding: much more practical in every way, easier to handle; output probably double; less expensive to operate; maintenance cost very much less. Mr. Trost, engineer, is extremely satisfied with work of electric welder, and stated that the advantages over any other form of welding for this particular line are so many that he could not begin to name them.

General discussion—These people have six of these welders installed, and are very enthusiastic over their performance.

Data on a Ferro Silican and Manganese Furnace

Name of firm—Pacific Electro Metals Company.

Location—Bay Point, California.

Name of appliance—Ferro silican and manganese furnace.

Manufacturer of appliance—Pacific Electro Metals Company.

Construction of apparatus—Brick with carbon lining.

Size—6 ft. by 12 ft. by 4 ft. deep.

Shape—Rectangular—top open.

Watts connected load—3000 kilowatts now; 7000 kilowatts ultimate.

Control—Thury Automatic Current Control supplemented with hand control.

Number of heating units—Three.

Temperature maintained—2800 degrees to 3000 degrees F.

Cycle of heating operation—Charged and tapped about every hour.

Weight of material heated—15 tons per 24 hours.

How material is handled—Roller-bearing push car and elevator.

Duration of process—Continuous.

Maximum demand—3000 kilowatts now; 7000 kilowatts ultimate.

Number of hours operated per day—Twenty-four.

Load factor—Ninety per cent estimated.

Diversity factor—One.

Number of kilowatts per month—1,971,000 kilowatt hours.

Amount of work done per month—400 tons.

Number of kilowatts per unit of product—4900.

Advantages over other fuel—No other way to attain high temperature on such a large scale.

General discussion—This installation is not in continuous operation yet. Supplied from a 22,000 volt, 3-phase line, which taps the 100,000 volt transmission line.

Data on Water Heating Installation

Name of firm—Napa Soda Company.

Location—Napa Soda Springs, Cal.

Name of appliance—Bottle washing machine.

Manufacturer of appliance—Michael Yundt Co., Wilwaukee, Wis.

Construction of appliance—Tank with endless chain arrangement for carrying bottles through the water.

Size—Approximately 10 ft. high by 7 ft. x 7 ft.

Shape—Rectangular.

Watts connected load—16 kw. connected load.

Control—Thermal control, started with time switch.

Number of heating units—Two heating units.

Temperature to be maintained—125 degrees Fahrenheit.

Cycle of heating operation—Operates approximately 13 hours per day.

Weight of material heated—Approximately 8000 lbs. water.

How material is handled—Water is kept hot.

Duration of process—Bottles washed continuously for 10 hours per day.



You've got to make the voltage high enough to be effective—BUY A LIBERTY BOND



Maximum demand—Sixteen kilowatts.
Load factor—Fifty-five per cent.
Diversity factor—One hundred per cent.
Number of kilowatts per month—Average 4300.
Amount of work done per month—8000 to 10,000 bottles washed per day.
Advantages over other fuel—Convenience, safety, cleanliness and absence of all attention.

Data on Electric Furnaces

Name of firm—Enterprise Foundry Company.
Location—South San Francisco, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliances—Enterprise Foundry, furnace; Allis-Chalmers Company, transformers.
Construction of apparatus—Brick-lined furnace, encased in brick.
Size—Three 1-ton furnaces.
Shape—Regular.
Watts connected load—350 kva. each. Single-phase.
Control—Transformer.
Number of heating units—Single-phase, one electrode each furnace.
Temperature to be maintained—Sufficient for melting steel.
Cycle of heating operation—Four hours.
Weight of material heated—One ton.
How material is handled—Ladles from furnace.
Duration of process—Three heats per day of 24 hours.
Load factor—Approximately 50 per cent monthly load factor.
Diversity factor—1.5 per cent.
Number of kilowatts per month—130,000 kilowatt hours per month.
Number of kilowatt hours per unit of product—1200 kilowatt hours per ton.
Advantages over other fuel—Application of heat control and cheaper.

Industrial Heating Data on Electric Furnace

Name of firm—Llewellyn Iron Works.
Location—Torrance, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made.
Construction of apparatus—Standard Heroult type 3-phase.
Size—Three-ton.
Shape—Circular.
Watts connected load—750,000.
Control—Automatic motor control.
Number of heating units—One furnace.
Temperature to be maintained—2800 degrees.
Cycle of heating operation—Four hours.
Weight of material heated—6000 pounds.
How material is handled—Manual labor.
Duration of process—Four hours on steel.
Operation—For own use only.
Maximum demand—750 kw.
Number of hours operated per day—Occasionally.
Load factor—About 85 per cent when in action.
Advantages over other fuel—Quality.

Industrial Heating Data on Electric Furnace

Name of firm—Union Tool Company.
Location—Torrance, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made.
Construction of apparatus—Standard Heroult type, 3-phase.
Size—One ½-ton and one 1-ton.
Shape—Circular.
Watts connected load—225,000 and 750,000.
Control—½-ton, motor control, manual; 1-ton, motor control, automatic.
Number of heating units—Two furnaces.
Temperature to be maintained—2800 degrees.
Cycle of heating operation—Four hours.
Weight of material heated—1000 pounds and 2000 pounds.
How material is handled—Manual labor.
Duration of process—Two hours on ore and four hours on steel.
Maximum demand—225 kw. and 750 kw.
Number of hours operated per day—Fourteen hours.
Load factor—About 85 per cent during operation.
Number of kilowatt hours per month—½-ton, about 80,000; 1-ton, about 200,000.
Advantages over other fuel—Quality of product.
General discussion—More furnaces to follow.

Industrial Heating Data on Electric Furnace
Name of firm—Warman Steel Castings Co.
Location—Vernon, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made; Heroult type, 3-phase.
Construction of apparatus—Special fire brick.
Size—Two-ton capacity.
Shape—Rectangular.
Watts connected load—1,200,000.
Control—Remote motor driven control.
Number of heating units—Two furnaces.
Temperature to be maintained—3000 degrees each.
Cycle of heating operation—Continuous.
Weight of material heated—Two tons.
How material is handled—Crane.
Number of hours operated per day—Twenty-four hours, one furnace.
Advantages over other fuel—Clean, convenient, better product.
General discussion—Very well satisfied.

Industrial Heating Data on Electric Brooders

Name of firm—Theo. Nehemed.
Location—Lennox, Cal.
Name of appliance—Chicken brooders.
Manufacturer of appliance—Artesia Electric Hatching Co.
Construction of apparatus—Microme wire and timber.
Size—4 ft. x 12 ft.
Shape—Rectangular.
Watts connected load—2000.
Control—Thermostatic.
Number of heating units—About 20.
Temperature to be maintained—90 degrees Fahrenheit.
Cycle of heating operation—Continuous 2 weeks.
Weight of material heated—Air.
Duration of process—Hatching season.
Operation—Continuous.
Maximum demand—2000 watts.
Number of hours operated per day—Twenty-four.
Load factor—One hundred per cent.
Diversity factor—Sixty per cent.
Advantages over other fuel—Even temperature, pure air, no danger.
General discussion—Well satisfied.

Industrial Heating Data on Electric Furnace

Name of firm—American Alloy & Chemical Company.
Location—Vernon, Cal.
Name of appliance—Electric furnace.
Construction of apparatus—Three-phase.
Size—One-quarter ton.
Watts connected load—150,000.
How material is handled—Manual labor.
Duration of process—Miscellaneous—ore tests.
Maximum demand—150 kw.
General discussion—Experimental for ores.

Data on Heating Installation at the California and Hawaiian**Sugar Refining Company**

An installation at the plant of the California and Hawaiian Sugar Refining Company, at Crockett, Cal., consists of automatic control electric heaters, for the purpose of maintaining a constant humidity. It seems that this company has been experiencing considerable trouble with powdered sugar. When it was packed in boxes containing too much moisture the sugar cakes. Therefore, they decided to endeavor to put the boxes in such shape that this trouble would be eliminated, and we understand that they have succeeded perfectly. It seems that the saturation point of the atmosphere varies with the temperature, therefore they can maintain a constant percentage of humidity by merely changing the temperature. The equipment consists of twenty-two 500 watt units, 110 v. each. These are connected three-phase, star, so as to balance the load on the three-phase distribution system. They are controlled by a hygrostat with relays, they in turn opening and closing the heater circuits. This apparatus is installed in a room 111 feet long by 40 feet wide, with a ceiling height of 10 feet. One wall is exposed to the bay and the other walls are partitions between rooms. The floor is fairly tight and the roof and ceiling sheathed with roofing paper. They are maintaining a humidity of approximately 55 per cent, and so far the maximum demand has been 30 kilowatts. This is a very interesting installation and it seems to have opened an entirely new field. The apparatus was designed and manufactured by the Electric Sales Service Company, of 109 Stevenson street, San Francisco.

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It doesn't pay to turn off the current until the operation is finished — BUY A LIBERTY BOND



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You've got to have money to run any business — BUY A LIBERTY BOND



BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

(If your customer doesn't get just as efficient service in your absence as when you act as salesman yourself, you can't afford to hire your clerks. The question still remains, of course, how efficient service you are capable of giving yourself. The discussion of sales methods and problems, as well as the best methods of advertising, presented here as a portion of a report drawn up by H. F. Allen, E. B. Criddle, H. A. Lemmon, M. L. Scobey and L. H. Newbert, will undoubtedly form one of the most entertaining as well as instructive parts of the convention proceedings. It constitutes one division of the Commercial Committee's contribution—Pacific Coast Section, N. E. L. A.—The Editor.)

SELLING METHODS

There are few electric dealers who cannot learn something from the sales methods adopted by the modern department or dry goods store. Their seasonal sales, their purchases of stock, the training of their salespeople, their window displays, their advertising, have all been reduced to such fine art that guesswork as to results has almost been eliminated. A careful study of their system cannot but be an inspiration to any retailer and with a little thought many of their methods can be adapted to electrical merchandising.

For instance, all their special sales are laid out months ahead, the window and store display is arranged, and advertising done, the goods ordered to be delivered at the proper time, and such arrangements regarding price fixing made that it is practically certain that no goods will be felt on hand which would have to be sold at a loss.

Advantage is taken of every season, every holiday and every event of importance, in fact it is almost true that there is no longer a dull season in the dry goods trade, an artificial demand has been produced at periods when business, under normal circumstances, would be dull.

With a little thought, and more forethought, it should be possible for the electrical dealer to develop his business along the same lines. In fact it should be possible for him to select appliances which would to some extent tie in with the goods advertised for their seasonal sales by the large department houses, and hence reap some advantage from their advertising by tying in his advertising and window displays with theirs. For instance, during their March sale of materials and hardware used in house cleaning, he might strongly advertise and attractively display vacuum cleaners and washing machines.

Again, February is generally recognized by the dry goods stores as the month in which to push dress-making goods and sewing necessities. This might be utilized to make a special effort to sell electric sewing machines, sewing machine motors and electric irons.

These instances might be extended to cover every month in the year; in fact, almost every week; and there is no doubt that by thoughtfully taking advantage of the educational work in promoting "out-of-season" sales, conducted by the large dry goods stores, that hundreds

of appliances that now lie in their stores merely on display might be sold by the electric dealers.

Christmas time should be as profitable a time for the electric dealer as it is for the retailers in other lines. The electric appliance is an ideal Christmas gift, combining, as "it usually does," attractive appearance with year-round usefulness, and it may truly be advertised that no gift gives such lasting pleasure or recall so often thoughts of the giver. Don't be afraid to advertise Christmas stock; a great majority of Christmas presents are bought through press advertising and attractive window displays.

The successful dealer must remember that just as people will not buy electric fans in mid-winter, they will buy the right appliance displayed at the right moment. It is up to him according to his locality and climate to judge the right appliance for the right moment and take advantage of the other retailers' advertising.

It should be the endeavor of the dealer to know every one of his customers by name, to become acquainted with the subjects which are of special interest to them and, above all, to make them glad to come in and see him, if only for a chat. In his dealings with his customers they must be right, however unreasonable their demands. Marshal Field built up his huge business on this principle and it is recorded of him that on one occasion he refunded money to a customer on an article which he had never carried in stock, but which a customer insisted she had bought at his store.

Before antagonizing a customer in case of complaint, even if you know him to be wrong, figure what his future custom may be worth to you. Just as a soft answer turneth away wrath so does a graceful concession on the part of the dealer secure the ultimate friendship of a complaining customer.

Not only should the successful dealer know all his customers by name, but he should have a list of them, and if his treatment of them has invariably been courteous, they may even welcome a telephone call from him during, say, the vacuum cleaner and washing machine sale in March, offering one of these machines on approval for 24 hours, with a brief but plain explanation of the selling price and terms.

The girl at the telephone must answer inquiries of all kinds with intelligent interest. She must not merely give the desired information, but she must take pains and trouble to handle it as though it were her



Even success in business wouldn't be worth much without success in the war—
BUY A LIBERTY BOND



best friend at the other end of the wire.

Courteous treatment and a genuine interest in customers or prospective customers pays, as the following incident will prove:

A firm had been advertising a suction cleaner. A lady who had read the ad 'phoned in for additional information, and this was the answer she received from the girl who answered the 'phone:

"Well, Mr. Brown isn't here. No, I don't know when he will be back. What? Oh, they are forty dollars."

The lady at the other end of the wire said "thank you," and called up another dealer. The girl in his shop answered thus:

"Mr. Smith has just stepped out for a moment. I will be very glad to give him a message. Vacuum cleaners? Yes, indeed, and a vacuum cleaner is just simply a wonderful thing. Unless you have used one you can't imagine the tremendous amount of work they save. There is one in my home and we wouldn't think of doing—but I am not going to spoil your pleasure and surprise by telling you about it. I am going to ask Mr. Smith to take one out to your home and have you try it—and let you be the judge. He will be glad to do so. Oh, that doesn't matter—whether you buy ours or not. There are several good makes. We will be glad to clean one room for you—from the ceiling to the floor," and she gets the name and street number.

Now, this is perhaps a small thing, but which house do you think landed the order? These small things are just the difference between success and failure.

Perhaps the dealer says he cannot afford a girl who has tact and knowledge to reply as she should during his absence. He is mistaken; he cannot afford one who can't. And this spirit must prevail throughout the establishment and include the proprietor. No visitor must be allowed to depart without feeling that it was a pleasure to call.

Doubtless one of the most vital points of interest to the contractor-dealer is the matter of window dressing, or rather window display.

Unfortunately it is one on which perhaps the fewest recommendations can be made, for much depends on what each individual dealer has in stock than can be displayed.

However, there are one or two recommendations that can be carried out regardless of what is being displayed or what is on hand for display purposes.

I believe I am safe in saying that there is not a dealer in the state who cannot put in a good display of Mazda lamps and any window would be appropriate at any time of the year.

Another item for display is flatirons, also acceptable at any season and an article practically always carried in sufficient quantities by dealers so that an attractive window can be made up.

The object of the window display is to attract attention to the store and this may be done by having a specially priced article on sale. But that is not likely to be the case with an electrical contractor, because his margin of profit is so small that it will not permit of cut prices.

Another means would be to have some new novelty or something not shown elsewhere in the city, but that, too, is unlikely to happen in the electrical business.

Yet another way is to have something alive, or moving, in the window, and that is where we shine, because we all have a motor of some sort that can be fixed up to run some sort of animated window display.

Whenever possible, have something of that nature in your windows, and it will arrest the public's attention.

It will be surprising to note the attention attracted to a window where such a simple thing as a mother cat and kittens are displayed, a rubber ball being blown about by an electric fan, or a bowl containing goldfish, to say nothing of the more complicated devices that can be connected to a small motor.

Just two more points I wish to impress on the dealer with regard to window display, and they are:

First—Don't display such material as loom, condulets and other wiring material, because the public does not know what they are, or if they did happen to know about them, they certainly are not interesting or pleasing to the eye.

Second—When making a display of irons, don't try to fill the window. A few will answer the purpose and look far better, to say nothing of the saving of work.

If displaying toasters, put in one or two percolators with a card suggesting that toast and coffee made



A DOUBLE ADVERTISEMENT

A circular band of advertising which is being stitched by this electric machine provides a double attraction for the window of the Sigwart Electric Company of Eugene, Oregon. The moving band calls attention both to the ease with which the machine is running and to the advertising items which go to make up the rotating strip of cloth.



They gave up their business to enlist—BUY A LIBERTY BOND



electrically are an aid to appetite and digestion.

Don't crowd your windows and try to put something of every line you carry in the window, because people in passing do not get any one definite impression.

SEVEN SALES POINTS

Tie in with the department store advertising.
Take advantage of Christmas opportunities.
Maintain pleasant relations with customers.
Cash in on telephone orders.
Provide effective window displays.
Choose your salesmen to represent YOU.
Keep your selling force educated as to your stock.

The average mind has a well formulated sense of balance and color. Care should be taken in every display that whilst the colors harmonize, the goods displayed are in sufficient contrast to attract attention to them rather than to the background whilst the main center attraction in the display should be so placed in reference to the remainder of the display that the whole is in correct proportion. A careful study of well displayed windows will do more to teach the art of window dressing than a volume of description.

The manufacturers are supplying live dealers with attractive cards and window display material, and when properly used they are a great help in getting the business.

The Salesman

The salesman is YOU, he is not an employee drawing down so many dollars per week and producing so much revenue for it, but he is to the customer the embodiment of you or your company. Is he a worthy representative? Are you paying him enough money to be a worthy representative? Have you taught him enough about your business to make him an efficient representative?

The three points about a salesman that appeal to a customer are neatness of appearance, courtesy, knowledge of his business, and without one of these attributes no salesman can be a success.

To consider them in the order named:

Appearance

The salesman's or saleswoman's appearance should be neat and tidy, and above all, clean.

It doesn't cost anything to have clean hands and finger nails, hair well combed and clothes brushed, and every woman is sure to notice and approve of the one who is neat in appearance. I can assure you they would not go the second time to any of our large stores where clerks were allowed to be untidy, or coatless, or where clerks were permitted to smoke or chew gum or tobacco while waiting on lady customers.

A pleasant, smiling countenance is an absolute necessity in a good salesman or saleswoman. The next time you enter a store in which there is one real pleasant looking salesperson amongst several who are wooden-faced or grouchy-looking, watch to which person customers flock, and what is more important, notice which makes the greatest number of good sales. Of course it is the pleasant appearing one, all the time.

Again, remember that to the customer your salesman is you, and if they obtain an unpleasing impres-

sion from the appearance of the salesman on making their first entry of that store it is possible that this impression may outlast all the good service you may render and bring all your advertising and display work to naught.

Courtesy

If the last paragraph applies to appearance, doubly so does it apply to courtesy. There is never, and never can be, any excuse for a discourteous word or gesture from a salesman to a customer. If a customer becomes so unreasonable that the salesman cannot handle the matter he should still courteously refer the customer directly to the dealer, explaining that a settlement of the complaint is in this case outside his province.

A good salesman will never allow the customer to speak first, but approaching her politely, will say "Good morning," and if after a slight pause the customer still fails to indicate her wishes, he will say, "Can we do something for you this morning," never a terse "Something for you?" of the five and ten-cent store. When he has sold the customer the goods she came in for he should politely and without any appearance of trying to force a sale, point out the line which is being specially pushed at that time, or some line in which he thinks the customer would be interested. If she shows the slightest interest he will immediately display the appliance in operation and explain its advantages fully.

When the customer is ready to leave the store she should, if time permits, be conducted to the door with a polite "Good-day, Mrs. Jones."

Women are particularly susceptible to courteous treatment, and other things being equal, it will influence their patronage of any particular store. By the courteous, diplomatic handling of a complaint, a good salesman can actually turn the cause for complaint into a good advertisement for the store.

Knowledge of the Business

Do your salespeople know all they should of the advantages to the customer of the appliances carried in stock? Can they tell a customer instantly why one article is slightly higher in price than another? If they do not know these things, it is certain that they cannot create in the customer that desire to buy that must be the prelude to the making of a sale.

You, personally, had some reason for buying a certain line of goods from a manufacturer. It might be that there was some particular advantage in the appliance selected which competing appliances did not possess. It might be that a specially low price was offered, and it is to be presumed that you are willing to give your customers the advantage of this low price. Have you told your salesmen why you made this purchase in order that they can explain to the customer its particular advantages either of quality or price?

Honesty in salesmanship and advertising is essential in modern business. Every misstatement or misrepresentation is certain to ultimately recoil on the head of him who makes it. But if your salesman does not know, your advertising writer does not know, they will almost certainly at some time make misstate-



An oversubscribed loan is the best sort of advertising to impress the Kaiser—BUY A LIBERTY BOND



ments out of very enthusiasm, and they can scarcely be blamed.

Immediately any new appliance is put on display call all your staff together, even the delivery boy, and explain fully its operation, its advantages, why it is worth the money asked, and the terms of payment on which it may be sold. This should be an invariable rule never to be neglected.

When a manufacturer's salesman comes into town, let him explain to your staff the advantages of the lines he has sold you. He will be glad to do it and feel more inclined to recommend the closer co-operation of his firm.

See that the central station representatives are fully aware of the lines you handle, their advantages and selling cost. They too will be only too glad to co-operate in the sale of appliances which mean an added load on their lines.

For some reason saleswomen are to be preferred to men in the electric dealer's store, particularly at this time when a shortage of male labor is rapidly developing. As already stated, the greater number of the appliances sold are for use in the home, which is essentially the woman's sphere, and a woman customer is more apt to be impressed by a saleswoman's demonstration of an appliance which the customer is herself to use than if the demonstration were made by a man. As a matter of fact, the average man feels self-conscious in demonstrating such appliances as electric curling tongs, hair driers, washing machines or sewing machines, and is not, therefore, at his highest selling efficiency.

The good electric salesman or saleswoman will make a study of the development and manufacture of the goods sold. For instance, he or she should know something of scientific illumination, something of art as applied to fixtures and their relation to various styles of decoration. Something as to the correction of troubles in appliances sold.

The dealer should see that the trade papers and manufacturers' literature are available for the use of salespeople, and they should be instructed to read specially interesting articles or advertisements.

Finally, again remember that you and your business will largely be judged by the appearance, courtesy and knowledge of your salespeople, and every point mentioned above requires careful thought and study if real success is to be attained.

ADVERTISING

The Amount That Can Profitably Be Spent on Advertising

Press advertising is almost essential to the successful retailer of today. People, and particularly women, have been educated to closely watch the advertisement column of the daily and weekly papers, and a very large proportion of their buying is done from the announcements in these columns. The dealer who fails to advertise, therefore, fails to secure much of the business which goes to his competitor or is directed into other channels.

This does not mean that the dealer should rush into print with full page advertisements, for careful investigations have shown that except under very unusual conditions 4 per cent of the total revenue from sales is the maximum expenditure which will secure profitable returns, and taken over the year this amount should not be greatly exceeded.

You purchase goods because you desire the goods more than you desire the money which they cost.

If you think more of the money you keep it and the other fellow keeps his goods. Therefore, an advertisement to be successful must impress the reader and stimulate his imagination to desiring the goods. He must not only desire them, but desire them more than the money they will cost.

Now we must consider that electric appliances—however desirable they may be—are not as essential to the household as is clothing or food, for example. Therefore we must excite our prospects' imagination, or in nine cases out of ten we will make no sale. He must imagine a condition which makes our devices very desirable.

First of all Mr. Dealer must determine whether his newspaper advertising will attract customers to his store, or whether it will prepare them for a call from his salesman, or a combination of both. Of course we all would be overjoyed to be able to write advertisements which would fill our shops with eager customers, and let it go at that. Unfortunately, however, a newspaper advertisement is not magic. This happy result can be accomplished with some kinds of goods—principally the staples. For example, there is no question a mere announcement that a certain grocery firm in our city will sell Gold Medal flour at one dollar per hundred pounds will result in a riot of purchasers, because every household must have flour, and each knows it is worth six or seven dollars. But the announcement that you will sell seven-dollar percolators for six dollars will not tax the energy of the police reserves.

We are all interested in this war. Most of us are more interested in it than we are in any other thing. If I were to advertise that I would come to this city and deliver a lecture on the war there wouldn't be enough people in the audience to smother the echoes of the theatre. If, however, General Pershing or President Wilson should fill the engagement, it would overflow. Now, in all probability I could quite easily get a speech written for me that in every way would be equal to President Wilson's but that would not alter things at all. One's interest and imagination could not be aroused. I could fill the theatre, however, if in connection with my speech, I advertised that some well-known vaudeville performers would appear with me, and the entertainment would be free. Having brought you into my theatre I could get your attention and your interest in my message—if I really had one to deliver.

So the dealer must not believe that he can construct an advertisement along legitimate lines which



You've got to follow up your first volley with a second — BUY A LIBERTY BOND



will pack his show rooms. He must introduce the vaudeville feature to get his people inside his doors, and then his ingenuity will supply means of interesting them in the things he desires. A common form of



If she has her mind fixed on something else, she may walk right past your store without noticing even the most attractive advertisement. It is not necessarily the day when most people are down town, for instance, that is best for your demonstration — they may be intent on the week's marketing and not have time for you.

business vaudeville—showing the device in operation, is a demonstration. It doesn't matter so much what kind—his own wife can tell him what kind will attract attention. If he decides upon this form his advertising should have very little to say about appliances; just a few concrete sentences regarding the particular result he is going to demonstrate.

Having arranged the stage setting in our show rooms for the demonstration, and having advertised it properly, we still have but fairly started. First comes the selection of the day or days in the week, and much will depend upon our wisdom in this respect. Probably in a large city we would be told to select Tuesday, or Thursday (or some other day) because ladies generally either stay at home that day, or do not stay at home, whichever the case may be. However, as a matter of fact, that may have no bearing whatever. Information from the department store may disclose that more ladies are on the street Saturday than on other days. On the other hand, further consideration may lead us to the conclusion that the day on which the greatest number of ladies come down town may not be the best for our purposes after all. They may come down for some special purpose, and consequently it may be difficult to divert them from their preconceived program; or they may not come in the right frame of mind; or the day may be one on which the particular class of people we wish to attract may stay at home. We must determine these things based on local conditions and community habits, and we must determine them correctly.

This method of advertising, however effective it may be, has its limitations. For example, it cannot be used many times during the year, and unless very skillfully handled, is dangerous.

So we will pass it up and go on to a consideration of an advertising campaign which contemplates a combination of both store and home-sales.

First, to whom are we likely to sell our goods; in my own mind I am satisfied that over 90 per cent of our sales are made either directly or indirectly to women.

If I am right our advertisements must be written for women. Columns have been written regarding the relative merits of morning and evening newspapers as advertising mediums, and they all sound good. Personally, I would be more interested in the character of the paper than in its hour of publication. Next comes a consideration of the space to be used. This also depends, in my opinion, almost entirely upon the size of the general run of ads in the paper selected. A quarter page of the Journal of Electricity, for example, would be of sufficient size to attract attention. The same space in square inches would not be nearly so prominent were it compelled to compete for attention in a section of a large newspaper devoted to half and full page department store announcements. In the average four-page country newspaper, single column 4 inch; is a desirable space, and a double-column 6 inch is quite a spread. It all depends upon what company our advertisement must keep.

While perhaps it has no bearing in this particular instance, it may be rather interesting to some to learn that a series of experiments with central station advertising in an average eight-page paper disclosed a number of peculiar psychological facts. One of them is that a one-fifth space is ordinarily more interest compelling than either a greater or lesser space. The reasons are perfectly plain, but not of sufficient importance to warrant a discussion herein. This is more space, however, than the dealer will be justified in using, at least until he is very sure of himself. However cleverly we design our ads, we must recognize the law of diminishing return, which is in effect that a dozen young ladies are not twelve times as beautiful as one; that collectively six men are not six times as intelligent as one; and that generally speaking a full page ad is not twice as valuable when measured by returns as is a half-page. Many ad writers believe firmly in the "little drops of water" theory and they tell you that



Don't blow up the church to get the man who killed your dog—he may stay home that Sunday to paint the floor. At-random advertising is apt to miss the very man who would buy your wares.

"steady, persistent, constantly-before-the-public newspaper advertising is the real thing," and they prefer a comparatively small space, but one which appears in every issue of the paper. If we are advertising appliances I prefer to use my advertising appropriation in a few brief smashes, and if I have but 50 inches at my disposal for any one month, I am far more likely to use



Write this ad in bold type all over the page—don't make the figures too small—
BUY A LIBERTY BOND



it all up in two or three issues than to spread it over all the days of the month. However that may be, the man who is writing ads soon acquires a style which indicates its own space. Personally, my ads are almost entirely one of two types—either very few words with lots of white space, or several hundred words—still with much white space. I find it very difficult to write anything in between these two extremes.

First of all, whatever you do, let your advertisement reflect your own individuality and personality. Don't attempt fine writing and don't attempt cute or humorous things. Don't attempt to write a section of the dictionary into your advertising; use words of as near one syllable as possible. Make it appear just like your every-day, commonplace conversation. After you have written it out read it aloud, or better still, have some one else do so. If it doesn't sound like you talk, change it until it does.

If you have many friends it is because of your personality, and if you haven't it is going to be hard sledging for you in a business of your own. Any successful competitive business is 10 per cent stock and 90 per cent personality. You can't use anyone's else. Use your own. And now let's just briefly touch the actual construction of an advertisement. We can of course rely upon the manufacturers of devices for advertisements in plate form, all ready for the newspaper. One thing in their favor is that they are properly displayed. Another is that they will be fairly good ads; but if you rely upon them you will be disappointed. And for just the reason outlined above. They present some other fellow's personality. If Billy Sunday, for example, were to go into business for himself and use such advertising as Tiffany's jewelry store uses he would go broke in six months, and at that he probably would last as long as Tiffany's would if it hired Billy Sunday to write its ads. Each has a personality which is peculiar to the individual; so you have; and this is the great reason why you should generally avoid the "canned" advertisement. The ready-made ad may have character, but it isn't yours, and it is your character which you seek to cash in on—otherwise you are unwise to enter the business maelstrom.

Just for the sake of argument suppose we have determined that we will feature coffee percolators, and have decided upon the amount of space to be used. It ought to be obvious that it doesn't matter in the slightest how much space we buy or what we write to put in it unless we can get people to read it. We all read certain articles in our daily papers because their headlines attract our attention—in some subtle manner they appeal to our imaginations. We pass up other articles without even being conscious of having read the headlines, although as a matter of fact we have. They simply didn't whip our brains to any effort whatever. So we may reasonably conclude that the headlines of our ad must arrest attention and make a mental impression on our readers if they are to read what follows. We must excite interest. Now there are many devices to accomplish this. A favorite one is the introduction of a picture. Unfortunately this has been somewhat overdone on the whole, until the average reader passes

pictures just as he does uninteresting headlines. This perhaps is largely due to the fact that many advertising pictures have no more character than have the canned ads. As it is impractical to hire a real artist to draw pictures for our ads, we must either do without them or use such as are available. In the latter case, be careful. Subordinate the picture instead of featuring it. Have them just sort of ornamental or incidental, as it were. A national advertiser at the present moment is running at the head of his advertisements historical pictures, such as Washington crossing the Delaware, etc., and endeavoring to tie these events into his desire to sell chewing gum, or whatever it is he is offering. Now I am interested in advertising and the advertising pages of magazines attract me first of all, and yet, after having seen a half dozen of those ads, I don't know to this day what thing it is that this fellow is advertising. In other words, the picture, if used, must fit into the advertisement and not introduce a subject or a line of thought entirely foreign to it.

You can get hundreds of these by going over your old stock of cuts which the manufacturers have furnished you and getting your printer to remove such portions of the plate as are not required. Personally, as a general rule, I do not believe in featuring a picture of the device itself. If I had to use one it would be very small and inconspicuous, and yet because most of the advertisements in the paper with which ours must compete for public attention will be plain type, it adds a certain attractive distinction to use a picture if possible. The next thing to a picture is white space. Use lots of it and pay for it cheerfully.

Laying Out the Advertisement

Do not trust to the newspaper compositor to lay out your advertisement, particularly if the paper is a small one. The lay out is to the advertisement what your window display should be to the appliances displayed and the finest copy in the world can be ruined by poor setting up.

Insist that the whole advertisement be set up in the same type face (in different sizes). A number of different type faces is confusing to the reader and creates a bad impression.

Emphasize only the heading and very important sentences in black face type or italics. Too much emphasis is no emphasis at all.

Select one type face and some distinctive type of lay-out for all your advertising and, having selected them, insist that you will only pay for advertisements that are set in this way and for which you have O. K.'d the proofs.

The ideal space for advertisements is of the same shape as that of display windows, that is length = $1 \frac{2}{3}$ width. As the standard newspaper column is $2 \frac{1}{8}$ inches wide, the ideal spaces are:

1 column, $3 \frac{1}{2}$ inches.

2 column, 7 inches.

3 column, $10 \frac{1}{2}$ inches.

A most important consideration in laying out an ad is: Whose attention do we wish to attract? Perhaps we exclaim: "Why, everybody's." Unfortunately



It's just as much your business as your store is—BUY A LIBERTY BOND



ly, it can't be done. For the reason that some of us prefer blonds to brunettes and others prefer blue serge to Scotch plaid suits, we simply cannot appeal to not alone everybody, but even to a very large percentage of our public in any one advertisement. Firing a high explosive shell into a crowded church just on the off chance of killing the man who shot your dog last week isn't efficient. Maybe he doesn't go to church, or if he does he may have missed this Sunday to stay at home to paint the kitchen floor. Instead of that, let's sit on his door-step and sandbag him when he does come out. It takes less ammunition and we get the desired results.

First, we must decide just what women we are going to appeal to—that is just what individual woman is repeated the greatest number of times in our community. Possibly we will conclude that the very wealthy do not offer a field that is likely to excite us to estimating future profits, and also we may conclude that the very poor are not likely to be so much interested in the means of making coffee as they are in getting the coffee to make. It would seem to me that our best field would be among those "just average" people, on the borderland, where about half of them rent and the other half own their own cottages; the husband receives from \$100 to \$175 per month.

It really doesn't matter in the least what class you determine on—that is in so far as the methods to be applied to writing the ad; we just change the appeal, that's all. If we have determined the class we are going after, we then must stop right there and get their viewpoint. We must place ourselves in their places, and determine to our own satisfaction what their great interest in life is, something about their family affairs and a good deal about their household arrangements. In other words, we must enter their home, or rather, imagine ourselves there.

Because we all are more or less alike, and because what is occurring in friend Jack Smith's home is occurring in many other homes, let's write our ad for Mrs. Smith. If the headline of our advertisement reads:

**"MRS. JACK SMITH,
YOU MAKE VILE COFFEE."**

The lady will read it and she'll probably call her husband's attention to it, and he probably will call yours, but that sort of an appeal has its disadvantage, although many of Mrs. Smith's neighbors and friends

will secretly agree with you. As a matter of fact, however, each lady probably believes she makes better coffee than do her neighbors. She will agree with you that their methods should be improved. There is nothing that gives such confidence in the wise uncanny judgment of the speaker as for him to tell his audience something they already know or believe. So if we change that heading to read:

"YOUR FRIENDS MAKE POOR COFFEE"

We will have combined two or three desirable elements. First, the word "your" is a personal message to every feminine eye which lights on it. Apparently it states an admitted fact and establishes your cleverness. It asserts something each lady has secretly chuckled over, and she wishes Mrs. Jones and Mrs. Brown, whose hospitality she has enjoyed on various occasions could read it and take it to heart. Of course, she herself has acquired the knack of making coffee that is famous, and she takes a satisfied interest and begins to wonder if Mrs. Jones and Mrs. Brown will realize that that ad is a personal message to them. So we have gained her interest, and having gained it, that half of the battle is over. Then, passing on to the body of our advertisement we perhaps begin with an alleged exclamation of disgust which a peevish husband or a tactless guest may have relieved himself or herself of when this poor coffee was sampled. And so on throughout we will continue our little lecture and innuendos, but always direct them at the neighbors and friends and not at the lady to whom the ad is addressed. It won't bring much excess profit tax to tell the lady herself that she has missed the art, but we can at the finish tell her how she can continue to make the excellent coffee for which she is famed, and do it in an easier, more attractive manner—the electrical percolator.

We tell her that this method will not interfere with the personal touch of the genuine artist, which she succeeds in infusing into her coffee, but rather will give her genius greater play, etc., etc., and then if we give free trials we will offer to send a percolator out to her for her judgment, which we are extremely anxious to have; or some other device which we may have invented to get a direct contact with her. The salesman who follows up this ad will take his text from it. There are many differences of opinion regarding



ATTRACTIVE PACKAGES

The neatness with which the package appears on delivery at the home has much to do with the second order and its placing. The Japanese package, wrapped in paper of many colors, and so arranged that the dealer's house and street number has a prominent place between the colored strings that bind it, have won the admiration of all beholders. The electrical contractor-dealer can, by proper care in sending out packages, build up a more profitable business by due attention to this little item of neatly and properly tying up packages.



It's not mere money you are subscribing, but the food and ammunition and ships for the boys—

BUY A LIBERTY BOND



printing the price. If you are going to use figures bear in mind that the written appeal must be very strong or the dollar sign will kill the whole thing.

Suppose, on the other hand, we head our advertisement "Electric Coffee Percolators." There is no reason in the world why it should arrest attention unless the reader has already made up her mind to purchase one. And then starting in in that manner, many of us will go on with a statement that our percolator is valveless, or set forth some other mechanical feature. Now, the lady of the house doesn't care a whoop



It is not the mechanical device you sell, but the picture which it raises in the customer's imagination. An effective advertisement which applies this principle.

whether the device is valveless or not. Her imagination is not excited by mechanical features. She is not even aware of their existence. Such an ad does not "promise benefits greater than the sacrifice" of seven dollars or whatever the price may be. Whatever blunders we may make we must bear in mind that we are not selling a device, but instead are selling the things a device will do in the home where it is installed.

The man who buys a fishing rod and a book of flies and plans weeks ahead, and goes out in the back yard and digs worms and feeds them coffee grounds isn't really intensely absorbed in a collection of worms, nor in colored feathers tied to hooks. What he has in mind all the time and what he is enjoying in anticipation, is a trip up into a cool of the mountains, the open air, babbling brooks, enjoyable lunches, congenial companionship, etc. In other words, the sporting house is not selling him a rod and fly book, but actually is selling him a trip into the country. It is selling him a picture of enjoyment and contentment which his own imagination paints. This is precisely what we must sell the ladies when we offer electric devices. Sell them a picture of pleasure, contentment, leisure, ease, etc. We don't endeavor to sell toasters, but we do sell companionship at the breakfast table.

One of the most effective—if not indeed the most effective—appeal to women is through their children. Any mother worthy the name will make untold sacrifices to bring happiness to her children. When your little girl climbs up and gets the toaster down off the pantry shelf and lugs it into the dining room and after

a few futile attempts finally manages to get it connected, she probably is as serious as any cook ever was. Perhaps she will not slice the bread evenly—it is barely possible she will not even toast it evenly, and it seems to me one slice did fall on the floor as she almost stood up in her chair turning it; but her eyes were beaming with joyous pride at being able to help mama and in doing something for daddy, and you will have to admit no toast ever tasted better. Did you glance at the misses across the table to see what was in her eyes? No; well, if you had you would never need to ask what appeal to make to mothers to sell toasters; and then just put that incident on paper and you have an effective advertisement.

Another form of appeal is an apparently indirect one. The word "apparent" is used, but as a matter of fact it is decidedly direct. Our advertisement will apparently be directed to the husband. Perhaps it will start out in black type, "Are You Giving Your Wife a Square Deal?" and then likely you go on and tell Mr. Husband of his office conveniences and comforts and then contrast them with the methods his wife is forced to put up with just because of his thoughtlessness or lack of consideration. Now, ostensibly, that ad is for husbands, but many more wives will read it than will husbands, and most of them will recognize the picture as applying to themselves. Discontent is the basis of all sales. If we were contented with what we had we wouldn't purchase other things, and it is remarkably easy to make people discontented with existing conditions, whoever they may be, and it is just as easy to use this state of mind for our own legitimate purposes. If we abandon once for all that we are selling devices and preach to our employees and our readers and to ourselves that we are selling the things these devices will do, and assist people to paint the picture of what they will do for them in their own homes, we cannot go very far wrong from advertising the way it should be done.

There is another form of advertising which, if well done, is rather clever; and the whole scheme is negative. It bears the hallmark of approval of the greatest advertiser who ever existed during all time—the devil, or Mr. Satan, as perhaps he prefers to be designated. He pulled it on Eve and has pulled it on all of us ever since with what must be a very satisfactory result. And that is playing on our resentment of unreasonably imposed restraint. Now, Eve didn't have any special use for an apple. All the fruit trees and berry bushes were doing well, the season had been favorable and the San Jose scale was still confined to one small peach tree on the back lot. As a matter of fact, it is quite possible she might have lived a long and useful life without ever having noticed that apple tree. And then all at once the Master Advertiser, Mr. Satan, started something. He made that miserable tree stand out above everything in the whole garden by simply informing Eve that she must not under any circumstances eat apples. So then, of course, she immediately began hunting about for that apple tree, and asking every gardener she met where it was and getting all impatient because they had never heard of it, and



If it were your store on fire, you'd pay for the water gladly—BUY A LIBERTY BOND



getting all sorts of misinformation such as that apples grow on vines, etc., but persisting nevertheless until she found it, and then sitting down and rebelling at the prohibition and wondering why such an unreasonable order should be given, and crying because she was so abused and misunderstood by the world, and bemoaning that the only thing she wanted in the world was denied to her. But some of you probably have heard the story and there is no use going into details. But she finally got the apple. Now we disciples of that great advertiser use that same device in many ways. For example, if we should advertise that we

that this letter is a good one—I only state that it sold toasters in connection with newspaper advertising:

Dear Mrs. Smith:

You can take one of the lids off the kitchen stove, and, by holding a slice of bread on a fork near the fire, make good toast—if the fire is just right. If it is too hot your toast will be soggy in the center, and if it is not hot enough it will simply dry out; but experience will teach you so you will know when the fire is just right. Of course you will toast yourself at the same time you toast the bread; but a little ingenuity will overcome that; gloves will protect your hands and you can hold a newspaper in front of your face. It is true that you finish but one slice at a time and may get discouraged because the family devours it as fast as you are able to toast it, and you are unable to sit with them at the breakfast table, but this cannot well be avoided, as you well know that toast made in advance is not real toast. You also know that toast made on top of the stove or in an oven is not real toast either—that toast, simple as it seems, is one of the most difficult things to make properly.

There is another way. You sit at the table and enjoy the meal with your family, with your electric toaster before you, and make it—two slices at a time—just as it is used. Delicious, golden brown, crisp, perfect toast—better than you have ever tasted before. The slices must stand upright to make perfect toast—there is a scientific reason.

Next to the electric toaster, the best way is to take the lid off the kitchen stove. Which do you prefer?

Yours very truly.

Now, the fact that this letter takes as its motif an old wood-burning kitchen range, when as a matter of fact the small city in which it was mailed used only coal and gas, did not bear on the results whatever. It did furnish two contrasting pictures and the use of the electric toaster was thereby brought out favorably. I surely believe it is worth while to have each letter addressed to the lady who is to receive it.

I have wandered out of bounds so many times in this discussion that no attempt will be made to cover any suggestions as regards follow-up methods of the salesmen. We must follow up, else no matter how much our advertising may pay, we are wasting much of its potency.

The copy of our advertisements should change frequently. The same wording should not stand for more than two days, and it is better to change it every day, if we can. If we wish to advertise a certain drive six days and only wish to supply two changes, then let them alternate instead of running three days continuously each.

There is as great a difference of opinion about the use of dodgers or hand-bills as there is about every other form of advertising. The truth is that each man develops greater strength in one line than he does in others. Personally, I freely admit my deficiency in launching a dodger which will be satisfactory. They certainly can be used to advantage announcing that demonstration we talked about a while ago, however; but if it is to be a demonstration of an electric toaster take especial pains not to say so. Instead, advertise as a demonstration of making toast electrically. It may sound about the same, but there is all of the difference in the world. It seems to me a letter is better than a circular.

GETTEM KEEPHAM
ELECTRICAL CONTRACTORS

Openoumnia, April 1 1921.

Dear Mrs. Smith.

You can take one of the lids off the kitchen stove, and, by holding a slice of bread on a fork near the fire, make good toast—if the fire is just right. If it is too hot your toast will be soggy in the center, and if it is not hot enough it will simply dry out; but experience will teach you so you will know when the fire is just right. Of course you will toast yourself at the same time you toast the bread; but a little ingenuity will overcome that; gloves will protect your hands and you can hold a newspaper in front of your face. It is true that you finish but one slice at a time and may get discouraged because the family devours it as fast as you are able to toast it, and you are unable to sit with them at the breakfast table, but this cannot well be avoided, as you well know that toast made in advance is not real toast. You also know that toast made on top of the stove or in an oven is not real toast either—that toast, simple as it seems, is one of the most difficult things to make properly.

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Next to the electric toaster the best way is to take the lid off the kitchen stove. Which do you prefer?

Yours very truly,

Gettem & Keepham
per J. Will Gettem

A letter which actually brought results

have only two dozen of our percolators left; that when they are gone no more can be obtained; that we will not set any of them aside; but on Saturday morning we will sell them to the first people who ask for them, we would have a line formed in front of our shops two hours before we opened—that is, if we could really convince them in our ad that it is true they could not get others like them. People would be in that line who never thought of owning an electric percolator, or were not even actively aware of their existence, but they would resent the idea that they could not have them if they wanted them.

Advertising as applied to electric devices, however, cannot perform miracles. If we are to get the full benefit of our newspaper space we must follow it up. It is one thing to instill a desire in the minds of our contemplated victims for that which we have to sell, but it is another thing to inspire them with the will to actually acquire them. Hence the necessity of follow-up campaigns. Much can be done with letters if the list to which they are sent is carefully selected, and the same principles apply to letter writing as to newspaper advertising. Don't start letters formally or stiffly, nor with descriptions of devices. I don't say



Co-operation means boys to fight, business to provide the necessities, and money to back them—



BUY A LIBERTY BOND

For some mysterious reason, our wiring campaigns are the best things we do as a whole. We all do much better work in those than we do in the sale of devices. One reason perhaps is that electrical societies have gone into this side of it more scientifically than they have at the other side. The manufacturer supplies expensive booklets, expensive newspaper electros, and all sorts of cards, etc. We order them and then waste them by simply sending them out unsupported or backed up by a consistent campaign. If your plan of campaign doesn't call for a booklet there is no use of sending out a booklet just because you have it; and if you send out the booklet by itself and not as a part of a planned campaign, you have wasted the manufacturer's money and your own time, and probably will eventually become of that all but extinct species of mentally deficient who chirp, "advertising doesn't pay. I've tried it and I know."

SOME CONTRACTOR PROBLEMS

BY J. M. CARLSON

(A straightforward consideration of practical problems as they present themselves to the man who thoughtfully analyzes his business. This presentation of some of the things which have not yet been said on the contractor's side of the co-operation question, forms an important part of the Commercial Committee report for the Pacific Coast Section, N. E. L. A., Del Monte Convention. The author is connected with the Central Electric Company of San Francisco, and prominent in contractor-dealer affairs. —The Editor.)

When I was asked to prepare a paper to be read at the convention, there immediately came to my mind many things that I would like to bring to your attention. I would like to tell you what we have accomplished as an association and what we are doing, but we have had many papers along this line and I know that you are more or less familiar with our association work. Instead, I would like to have you consider some of our problems and if possible help us with them.

On every occasion where men meet we hear discussions regarding the various business problems brought on by the existing conditions in the world at the present time. It behooves us, as men engaged in the electrical business, to give some of our own problems serious thought. It is not my intention to try and discuss all of our problems in a short paper of this kind, but just to bring some things to our attention for thought and discussion, and if possible in the near future arrive at a solution of our difficulties that will be fair and just to all.

I understand that another paper is being prepared by a retailer, so I will not touch on any phase of the retailing business, although the contractor and the retailer are very closely related.

As contractor-dealers, we feel that we have a particular place and part in the electrical industry, as well as the central station, manufacturer and jobber. The public cannot get along without the central station, manufacturer, jobber or contractor-dealer, and I feel that one branch cannot give the proper service without the other.

As contractors we should always strive to put our

business on a high plane, and keep it there. We all know that the electrical contracting business has suffered in the past by the methods of unscrupulous and incompetent contractors. I refer particularly to the contractor who has started in business on borrowed capital and credit, and boasted that he would show the old established contractor how to do business. He proceeds to take a contract for about one-half of what it is worth, and when extras come up, charges the owner about twice what he should, in order to make up the contract losses; the result is that the owner calls him and all other contractors robbers. On account of taking the contract on such a low basis he cannot afford to employ a competent superintendent, neglects the job, and the further result is he and all other contractors are called unreliable. We should always conduct our business on such a basis that we can give the public the very best quality and service. All contractors should have enough overhead and profit on their contract work so it won't be necessary to overcharge on time and material and extra work to keep from going bankrupt. We can then expect the confidence of the public and more work on a time and material basis.

The contractors themselves have not been entirely responsible for this condition, which to a large extent has been eliminated. The jobbers and wholesalers have permitted this kind of competition by giving credit without proper investigation. I believe that every man who is going to engage in the contracting business should undergo a rigid examination as to his fitness, whether he has any business experience or knows how to figure, his knowledge of overhead expenses and necessary profits. Any contractor in order to continue in business, pay his bills, and permit the old established contractors to pay their bills, must have this knowledge and not start to experiment for a year or two and demoralize the whole electrical contracting business. I want to quote from a letter written by Edward N. Hurley, chairman of the Federal Trade Commission:

"The Federal Trade Commission has found that the majority of retail merchants do not know accurately the cost of conducting their business, and for this reason they are unable to price their goods intelligently. There must be decided improvement in this direction before competition can be placed upon a sound basis, and before we can expect a decrease in the heavy business death rate among retail merchants."

What applies to the retail business applies to us. It is possible to get this knowledge, but some men are so stubborn and "all-wise," they won't listen to reason or take advice. The failure of an electrical contractor through wrong business methods is not only disastrous to himself, but affects more or less all the contractors as well as the industry as a whole. An investigation of the fitness of a prospective contractor would be a protection to him as well as the established contractor. I have been a member of a contractors' association for many years and I don't see how any man can be a permanently successful contractor unless he takes an active interest in association matters.

Sometimes there have been misunderstandings



This is just one of the overhead expenses which must be paid in order for us to have a business at all



BUY A LIBERTY BOND

between the central stations and contractors over costs of installation made by the contractors for the power companies — especially wiring for electric cooking and heating devices. A lot of these misunderstandings could be obviated if the central stations would not lose sight of the fact that the contractors have an overhead expense that must be met, and also need a profit. As stated before, any contractor who desires to give good service to either central station or public must be given enough margin to allow him to employ competent office help and superintendents.

I will not take the time to discuss the proper allowance for overhead expenses, because we have had so many papers and discussions on this subject in the past, but in a little booklet issued by the Federal Trade Commission they give an example how to arrive at the selling price of an article and they use 25 per cent of the selling price as the overhead charge. Now, of course, they do not say that 25 per cent is the proper amount, but you can readily see what their thoughts are. After investigations and experience, we all have definite ideas that remain with us and we give expression to them in one way or another. I believe if everything is taken into consideration it will be found that the cost of installation by contractors is very reasonable by comparison.

As contractors we are very anxious to have the good will and co-operation of the central stations, as well as of the other branches of the industry, but of course we would like to have our part in the industry recognized. We are always open to suggestions and constructive criticism, as we are anxious to put ourselves in position to serve the central station and consumer.

We have enjoyed for some time the co-operation and good will of the jobbers and we appreciate it, but there are still some things that we feel need correction. There is a great deal of so-called industrial business that should be taken care of by the contractor-dealer. I do not mean certain large industrials that buy thousands of dollars worth of electrical goods and employ a force of electricians doing new work and extensions, but there are hundreds of small industrials and office buildings, etc., that I feel we can take care of just as well if not better than the wholesaler. It is not always necessary that we should furnish electricians to these office buildings and small industrial plants in order to supply them with their material, because often they have a man to make their small extensions and renewals. There must be a good deal of this kind of business because many times I have been in the wholesalers' stores and watched a clerk show the handy man how to connect up sockets, attachment plugs, and even lay out small wiring jobs, while wholesale customers were waiting.

I believe if the jobbers would make their stores, and windows especially, look more like wholesale establishments they would not attract retail customers and small industrials. Instead, we see fuses, sockets, attachment plugs and dozens of other small articles

laid out in the window, which at once gives the impression that it is a retail store. Other businesses that draw a very distinct line between wholesale and retail make their stores look either like a wholesale establishment or a retail store, and put up the proper signs. Although conditions for contractor-dealers handling industrial business are not as favorable as we would like to have them, some contractor-dealers through the service they are rendering have secured the industrial business in their immediate neighborhoods. As other contractor-dealers develop their service to industrials and demonstrate their ability in this direction, we believe the jobbers and manufacturers will find that we can serve them as well as serve the customers in handling this industrial business and that they will therefore help us to place that class of business on a better basis.

There is another matter I want to bring up for consideration, and that is our relation to the electrical engineer; I mean particularly the engineer that lays out wiring plans and draws up specifications for buildings and industrial plants, etc. Some time ago we felt as contractors that this part of the work belonged to the electrical engineers and the contractors should refrain from laying out work and writing specifications. We of course in turn expected the electrical engineers to recognize the fact that all installation work should be done by the contractors. Instead, we find in a good many instances the electrical engineer recommending to the owners the employing of a foreman, hiring electricians, and the direct purchase of materials, cutting out the contractors entirely.

We do not believe that the owners finally save any money by this method, and their office has the constant worry and detail work which is additional expense. If the installation work is handled by a reliable contracting firm, they shoulder all worries regarding labor and material, finally turning over the completed installation to the owners, without, I believe, any greater cost than when handled by owners direct through a foreman.

In conclusion, I want to say that I have not tried to bring out all the points involved in the different matters I have brought before you, but only endeavored to bring these things to your attention so we can discuss them freely and frankly. As contractors we are anxious to co-operate with central stations, manufacturers, jobbers and electrical engineers, and ask your support and co-operation.

An automobile is a good thing when it is in good running order and every part is in its proper place, and is performing its proper duty; but just as soon as a part gets out of place and tries to do something for which it was not intended, there is trouble and the whole automobile loses its real usefulness. The same applies to our industrial activities.

As I have said, we all have a place in the electrical industry and our slogan should be "All together, every branch in its place, for Everything Electrical."



Our duty is a thing no one else can do for us—BUY A LIBERTY BOND



BETTER SELLING METHODS

(Increased efficiency in business is the greatest of war savings. The work which is being done to this end in the electrical industry, as instanced in the electrical co-operative campaign, and suggestions for the future, form the main body of the Commercial Committee's report for the Pacific Coast Section, N. E. L. A., convention. An important recommendation for the concrete organization of working data is contained in the report of the sub-committee which follows.—The Editor.)

In order to fully outline the first section of this committee's work, we again call your attention to the following two paragraphs quoted from the Commercial Committee's report that was read at the Riverside Convention last year:

"It is the sense of the committee that the member companies of the Pacific Coast Section get solidly behind the dealer and contractor movement, support the California State Association of Contractors and Dealers by helping it to create a fund for handling its work to better advantage, including the employment of a competent field man, and take advantage of the large volume of advertising, both national and local, already in the field, to the end that the central station of this territory may get the benefit to the fullest extent, of all elements that go to make up the industry.

"We believe that the member companies will benefit by fuller co-operation with the organization of contractors and dealers, with the thought in mind that in the contractors and dealers the central stations have active and energetic salesmen without the necessity of having these men on their payrolls. We believe the time will come when the central stations can leave the merchandising subject entirely in the hands of the dealers, with such supervision as must naturally be exercised by the central stations to get the best results for all interests."

The discussion following that report finally resulted in the following resolution being adopted by that convention:

"That the member companies of the Pacific Coast Section lend active co-operation and support to the California Association of Electrical Contractors and Dealers and that a proposed plan be formulated by the Commercial Committee."

Your committee, assisted by the contractor-dealers and the jobbers, carried out the instructions contained in this resolution, and late in September placed before the Executive Committee of the Pacific Coast Section, N. E. L. A., before the California Electrical Supply Jobbers, and before the Executive Committee of the California Association of Electrical Contractors and Dealers, a proposed plan for a co-operative sales, advertising and educational campaign.

The plan, after some modification, particularly in respect to the method of management, was endorsed by executive committees representing the central station, jobber and contractor-dealer organizations, and an advisory committee of eight members was appointed to carry on the work. The advisory committee is charged with the direct conduct of the campaign and is responsible to the central station, jobber and contractor-dealer organizations for its successful progress.

A fund amounting to approximately \$12,000 was subscribed to defray the expenses of the campaign. The various interests subscribed to this fund approximately as follows:

Central Station Companies.....	\$6,000
Jobbers	3,000
Contractor-Dealers	2,000

the remaining \$1,000 being made up by a few manufacturers.

The plans of the advisory committee for the use of this \$12,000 fund are based on the original recommendations of your Commercial Committee, amended by the executive committees of the organizations interested.

The advisory committee has outlined the plan approximately as follows: They feel that the development of a successful co-operation and understanding between the central station employees and the dealer-contractors and their employees is an essential foundation for future development and educational work. It is therefore the committee's object to bring about a better understanding of the duties of the contractor-dealer and of the central stations to each other and to cause the individuals affiliated with every branch of the electrical industry to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry. Following this foundation work will come the accomplishment of the objects specifically outlined in the Commercial Committee's plans, namely: Stimulate the sale, installation and use of all kinds of current consuming electrical devices; to originate a suitable trade mark for the California Association of Electrical Contractors and Dealers and to promote its use in electrical advertising; to help the contractor-dealers to improve their business methods, including accounting, sales, advertising and general store appearance, and finally to elevate the retail side of our industry to that position in the commercial world to which it is justly entitled.

Many central stations have indicated their willingness to contribute to the committee a portion of their regular newspaper advertising space, which is to be used to advertise the electrical idea and to feature the electrical dealer and the association's trade mark.

The California Association of Electrical Contractors and Dealers has contributed a portion of the services of their secretary, who now acts as secretary of the advisory committee.

Two field men have been appointed to carry on this educational work under the immediate direction of the advisory committee. The field men are expected to visit and work in various towns throughout the state, one in the southern end of our state and the other in the northern end. Wherever it seems advisable a special get-together meeting will be arranged by the advisory committee, through the field man, in towns where it seems that such a meeting will help forward the work of the campaign.

The field man is expected to visit the central station managers and employees in the towns visited in



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an endeavor to influence them to closer co-operation with the contractor-dealers and their association. He is to promote better acquaintance between the central station employees and the dealer-contractors, and to encourage the central station manager to indicate to his organization that it is the central station's policy to support this co-operative campaign. The greater portion of the field man's time, however, will be spent with the dealers and contractors, assisting them in their efforts to improve their business methods, including accounting, sales advertising and general store appearance, and also to secure their closer co-operation with the central station in their town.

The advisory committee handling this campaign includes men from all branches of the industry, and from all sections of the state. It consists of:

L. H. Newbert, chairman, manager Commercial Department Pacific Gas & Electric Company, San Francisco, Cal.

G. E. Arbogast, vice-chairman, Southern California Edison Company, Los Angeles, Cal.

G. B. McLean, assistant superintendent of sales, Southern California Edison Company, Los Angeles, Cal.

A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, Fresno, Cal.

R. M. Alvord, chairman Commercial Committee, N. E. L. A., local manager supply department General Electric Company, San Francisco, Cal.

D. E. Harris, sales manager Pacific States Electric Company, San Francisco, Cal.

H. C. Reid, president California Association of Electrical Contractors and Dealers, Pacific Fire Extinguisher Company, San Francisco, Cal.

M. L. Scobey, Home Electrical, San Francisco, Cal.

The reports of progress that have appeared in practically every issue of our local electrical press since last December are but one evidence of that committee's activity in carrying forward the work allotted to it. The Commercial Committee sees in this campaign the vehicle by which our industry may reach the satisfactory co-operative basis suggested in the report of last year's committee, particularly in the paragraphs previously quoted, and therefore again recommends that the member companies of the Pacific Coast Section get solidly behind this campaign work, not only with the funds which they have contributed, but with enthusiastic moral support.

The second section of the committee's work consisted in preparing or having prepared the four papers for this convention, and a report on industrial electrical heating. It was the consensus of opinion of the members of your committee that, although there would be no time to present the industrial electrical heating report at this convention, a subject of such rapidly growing importance as a central station load builder should not be entirely overlooked, and that this year's committee should carry on the excellent work that was started by Mr. Holloway in connection with last year's Commercial Committee. Consequently, a report on Industrial Electrical Heating was prepared by the sub-committee composed of E. A. Holloway, J. B. Black and E. B. Walthall. This report is published in the current issue of the Journal of Electricity. Your particular attention is called to the recommendation made in this report to the effect that future Commercial Committees adopt a similar plan of appointing a sub-committee on Industrial Electrical Heating to carry on further investigation and collection of data on this important subject.

The paper entitled "Bricks Without Straw," prepared by the sub-committee consisting of G. B. McLean (Chairman), W. S. Berry, C. M. Einhart, H. J. Kister and Miles Steel, contains a recommendation that should have your consideration at this convention. It is to the effect that the advisory committee handling the California Electrical Co-operative Campaign be authorized and be supplied with the necessary means to collect and catalogue all valuable sales data on electrical subjects, not only for the use of central stations, but for jobbers, dealers and contractors as well. It is the committee's desire that plans be adopted for carrying out the idea of this recommendation.

The committee further points out that this recommendation is in no way contradictory to that of the Industrial Heating Committee's report, as the advisory committee of the California Electrical Co-operative Campaign would need the assistance of the Commercial Committee, and of other bodies, in carrying out the recommendations made in the paper "Bricks Without Straw."

The Commercial Committee solicited a paper from an electrical jobber and one from an electrical contractor.

The paper presented by Mr. T. E. Bibbins contains an outline of the factors that make for success in the Electrical Jobbers Association, factors that can well be adopted by all in securing the closest working arrangement between all members of the industry—be they jobber, contractor, manufacturer or central station.

The paper "Some Contractor Problems," presented by Mr. J. M. Carlson, points out some of the problems of their particular branch of the industry, and indicates that they are alive to some of the difficulties that they themselves must overcome within their own ranks in fulfilling their obligations as a major division of the electrical industry.

It was the opinion of the committee that it would be fitting that there should be presented at this convention not only reports of particular value to central station men, such as the industrial heating report, but also a paper or report that would give in a similar detailed way practical information that would be of value to the electrical retailer. It was felt that the small central station operating retail stores, as well as the retail electrical dealer, could profit more than they now do by the adoption of retail selling practices that have been found of value in other industries. The paper entitled "Retail Selling Practice," prepared by the sub-committee consisting of L. H. Newbert (chairman), H. F. Aller, E. B. Criddle, H. A. Lemmon and M. L. Scobey, therefore, goes much into detail respecting the retail selling practices that are there outlined. Mr. Newbert has announced that credit is also due to Messrs. G. O. Mantle and H. R. Wilbur of his office, who have been material contributors, and of particular assistance in the preparation of this paper.

It has been suggested informally by members of the advisory committee of the Co-operative Campaign



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that their committee would probably desire to distribute generally to dealers and to central stations operating stores, reprints of this paper, particularly as it may well be considered a text on the subject of retail selling.

In all of our work the members of your committee have kept prominently in mind the fact that we are at war, and that all we are doing, and will do, must be measured by the question "Will it help win the war?" We feel that any study that will assist toward more efficient operation, which will enable us to do with less men the work which we did two years ago, will help in that our most important work. We have therefore presented in the reports and papers ideas which we felt would aid men in all branches of our industry to higher efficiency in their various endeavors.

We add the very definite recommendation that our selling force should be directed to the exploitation of those electrical devices that may be used in the home, on the farm and in the factory to increase efficiency in those places, and particularly to those cases where electricity generated by water power may be used in mechanical or heating processes for which energy is now supplied from our diminishing supply of fuel. The electrically heated core baking oven will increase the efficiency—particularly from the labor and fuel standpoint—in the foundry; the electrically operated feed grinder or water supply system will release labor and increase farm efficiency, while the electrically operated washing machine will in a like way assist in the home.

There is enough work in this program to provide profitable activity for all of us. We are going to win this war. Let us sell the "Electrical Way" in all places where it will increase efficiency and conserve labor and fuel for the more important purpose of bringing nearer the final success—Enduring Democratic Peace.

"BRICKS WITHOUT STRAW"

BY G. B. McLEAN (CHAIRMAN), W. S. BERRY, E. M. EINHART
H. J. KISTER, MILES STEEL

"Ye shall no more give the people straws to make bricks, as heretofore. Let them go and gather straw for themselves."
—Exodus 5:7.

The outlook was very dark in the latter weeks of the old year to the heads of central station commercial departments. When the order went forth that money was not available for extensions and that it would not be possible, therefore, to continue to take on business at the same rate as heretofore, gloom settled in the new business offices in thick, clammy chunks.

At the time of the appointment of your committee in the first week in January, to prepare a paper on "Bricks Without Straw," the depression in the sales departments had communicated itself to all branches of the industry and the year 1918 was looked forward to with misgivings and counterfeit enthusiasm. Consequently your committee went to work with heavy hearts and little hope of any great success on a paper on such a subject under the apparently unfavorable circumstances.

In this country and Canada, the best thought of the industry has been applied to load factor building and saturation problems. The selling of juice has been brought up to the dignity of an art and has been treated from a multitude of angles by the commercial section of the N. E. L. A. and the Society for Electrical Development. An exhaustive paper would really consist of a summarization of the publications of these two bodies, treated with special attention to load building, necessitating a minimum increase in capital invested. In the case of the commercial section, this has partially been done in the Salesman's Hand Book. If the vast amount of data and the original ideas and suggestions published by the Society for Electrical Development could be catalogued, cross-indexed, and added to the Salesman's Hand Book, the result, we believe, would be probably the sum of human knowledge on the subject. Your committee ambitiously attempted to do this work and, in addition, to cull the recent files of the current electrical magazines, epitomize the data and present it in the form of condensed suggestions for high return business getting. The task was found to be entirely beyond either the capacity of the committee, or the time at its disposal, and the idea was reluctantly abandoned.

During the time spent in an endeavor to make a condensed resume of the mass of data referred to, events were occurring in our world which were to entirely change the whole complexion of things. It is not necessary to go into the history of the causes here; suffice to say that the result showed nothing less than the fact that electricity had won its great fight, at least here on the coast. The years of painful pioneer work appeared to suddenly bear the fruit of positive success; central station service came into its own; we went over the top and the enemies' trenches were captured. Now we have only to consolidate our ground, perfect our communication system and the future is secure. There will be skirmishes here and there and possibly a hot little scrap occasionally, but we have the business coming to us now instead of having to go to the business—agricultural load, industrial, isolated and refrigerating plants, cooking and heating load, irrigation, rock crushing and mining. Central station offices in California are besieged by day and agents are called out of bed at night by anxious applicants for central station service. The question now with the man who must see, sew, churn, milk, pump, dig, heat, freeze, drive, lift, grind, or do practically anything in the realm of human industry, is not "Shall I perhaps consider electricity?" but "Can I possibly get electricity?"

Electricity in universal demand and the nation in the greatest struggle of its life, we are not confronted with the problem of increasing our load or increasing our saturation, but we must wisely endeavor to segregate the load proffered and arrange to serve that which is the more important in its relation to the war. Our question should be in considering the taking of load, does it mean more food, more supplies, more equipment, or is it simply for the convenience or profit of the applicant? With the great impetus given agricul-



What do you mean, you are an American?—BUY A LIBERTY BOND



ture and manufacturing, for the world's need, we feel that every central station in our section will have its resources taxed to the limit if it provides the energy necessary for such increased burden.

To be sure this is an abnormal situation. A cessation of hostilities would materially change conditions. Nevertheless, we do not believe it will ever again be necessary to bear the burden of such a competition as has characterized the last fifteen years. But it will be very necessary to organize the industry as a whole to keep pace with the marvelous development which some of us think we see in the very immediate future. This organization can best be accomplished by the intelligent prosecution of the co-operative campaign fairly launched. The insistent demand for electrical energy is an established fact. To meet this demand with the best interests of all concerned, let the central stations turn their attention to producing the current and developing the still available water power resources of our great Southwest; let the manufacturers make an honest effort at quantity production at fair prices, furnishing the necessary equipment for all branches of the industry with an eye to future development, rather than present profit; let the jobbers strive to finance complete stocks and liberal, intelligent credit policies; let the contractors get together, co-operate and endeavor to handle their affairs on a standardized business basis; let the dealer make his store attractive and his methods of merchandising and accounting be done in conformity to a general organized plan. This sounds like a large order, but your committee feels that the time is ripe for the filling of just such an order and that the advisory committee of the co-operative campaign is the instrument ready at hand.

It is therefore the recommendation of this paper that the advisory committee be instructed to codify, catalog and index the data contained in the Salesman's Hand Book, the recent publications of the Society for Electrical Development, and the recent files of the leading electrical magazines, together with such other available data and information as may be pertinent, with the object in mind of assisting the jobbers, contractors and dealers to do their part in the co-operative scheme sketched above; that the data so obtained be kept in an easily extendable form on cards; that each use for electricity be a subject head, and that all suggestions from whatever source be added from time to time to these cards; that the field men be instructed to carry this data when making their rounds and make liberal use of it in suggesting new and improved methods. For example, the heading "Residence Lighting" would, in addition to the wall sockets, base plugs, indirect lighting, portable lamps, etc., call special attention to the 50 watt lamp and would contain suggestions for popularizing it at the expense of the 40 watt. It would also point out to dealers the advantage of a more extensive use of telephones as a merchandising agent. One central station tried the experiment of selecting fifty consumers'

names at random. Twenty-five were called over the telephone and a sales talk was given on lamps, and twenty-five were called upon by a salesman. The telephone calls resulted in renewing thirteen 60 watt carbon lamps and in selling six 60 watt and one 75 watt tungsten lamp, while the personal calls resulted in renewing eight 60 watt lamps. The sales advantage of the telephone over the personal call is quite apparent in this instance.

"Residence Power" would contain data covering the merchandising of fans, washers, cleaners, small motors, grinders, polishers, with suggestions to the contractor showing him how to get the co-operation of the architect in providing for this class of load in new houses, and to the dealer for the handling of the more expensive apparatus on the installment payment plan. Cooking in the home should be treated as a special subject and all possible data, of which there is now a very considerable amount of a reliable sort, given to the dealer for the purpose ultimately of relieving the central station of the burden of merchandising domestic cooking outfits. Another instance, in ornamental lighting, a central station recently obtained a contract for post lighting which was financed in a new and painless manner. The contractor should work up such business and make the profit. Teach him how.

Water heating, air heating, agricultural power, industrial power and heating, and specializing load of every description, should each and all be treated with the co-operative end in view, giving to each class that data which will best aid in the particular part to be performed by that particular class.

The Romans had a saying, "Non Sine Labore," "Nothing Without Labor." The success already achieved has been at the expense of heart-breaking toil. The objectives aimed at in this paper will only be attained by most strenuous endeavor on the part of all and more particularly by the intelligent effort put forth by the contractors and dealers in organizing themselves to take their responsibilities. Not a job to be done in days—years may be necessary to complete our picture—but we believe it will be completed.

We are at the threshold of the greatest expansion this industry of ours has ever seen. It may appear to some that your committee has been carried away by an enthusiasm which is not warranted by the facts. Time must prove whether we are right or wrong, but if we may venture to prophesy, we believe that the next few years will see a development in the practical applied use of electricity, which particularized now, would sound too optimistic, and that in this development, the jobbers, contractors, and most of all the dealers, will be found to occupy that place which is by right theirs, and to lend that aid to the general result which they should lend as necessary and component parts of the great industry which is the bread and butter of us all. The future is certainly bright and to your committee the road seems open to the promised land where Bricks without Straw will be among the memories of battles won and obstacles surmounted.



A republic depends on its citizens doing their duty because they recognize it—
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SPARKS—Current Facts, Figures and Fancy

(Geography is being much changed these days in Europe—and in America, too—according to recent reports of the Geologic Survey. The application of electricity to war conditions from "All Clear!" signs for aerial raids to the stabilizing of aeroplanes, the saving of coal in Switzerland and the teaching of war saving in domestic science schools conducted as part of a range campaign in this country, is significant of the day. The money thus saved, presumably, is to be put in Liberty Bonds.—The Editor.)

During the recent cold weather of the East there were many localities in which the only utility which didn't peter out was electric service. Further comment would be superfluous.

* * *

Fifty-ton electric locomotives are being used for freight handling by a Manchurian coal mine. They are of the two-bogie type, each bogie carrying 125 horsepower motors, and they are the first of the kind ever built at the South Manchuria railway workshops.

* * *

Orville Wright is credited with having invented a new type of airplane stabilizer. This stabilizer, operated electrically, rejects the old principle of the gyroscope and substitutes a pendulum which swings in water. This motion controls the supply of current to a small propeller over the pilot's head.

* * *

Although illuminated signs have been forbidden in London, owing to air raid danger, they are being used in one suburb of London to warn citizens against these very raids. "Take Cover!" flashed at every lamp post, warns citizens of an impending attack, and "All Clear!" signifies that danger is past and traffic may be resumed.

* * *

Luminous paint has found many applications in the home, from assisting the householder to find the matchbox to giving the position of the electric switch. It is reported that it is being put to many uses in the present war. Luminous gun sights are no secret, but there are said to be many other applications which cannot be described at present.

* * *

You may not be on the map, according to recent Geologic Survey reports — at least not at the place where you ought to be. You may be five or six miles distant from where you are. A re-survey and determination of latitude and longitude, which has fixed definitely many thousands of points over the United States, has shown that former maps were often inaccurate to a quite appreciable extent.

* * *

While it was well known that the large colony of squirrels in a Georgia community were active in their attacks upon the pecans grown there, it was a surprise to learn that they had gone so far as to attack the telephone wires, but such has been found to be the case. When complaints were sent in of trouble in one of the residential sections of the city and the telephone

company went to locate it the lead in one of the large cables was found to have been gnawed three-eighths of an inch deep by the sharp teeth of the squirrels.

* * *

The gain in profits to the farmers alone in a year, through the rise in the value of farm products over normal pre-war levels, is estimated at over six and one-half billion dollars, or sufficient to more than twice cover the total offering of the Liberty Loan now being subscribed by the American people.

* * *

It is reported that the French are making extensive use of electricity at the front in the operation of all kinds of excavating machines. Working in ordinary earth, four men with two wheelbarrows and a machine driven by an electric motor, can shift from 25 to 35 tons a day. In a month a shelter with sleeping accommodation for 500 men can be dug by a single company.

* * *

In order to save coal which can only be imported from Germany, Switzerland is reported to be planning to electrify its entire railroad system. This will necessitate the further development of Swiss water powers and the construction of new power works for about 500,000 horsepower turbine development. The necessary power stations will have to furnish about one and a half billion kilowatt hours a year.

* * *

A domestic science school held in connection with a gas and electric company's demonstration of ranges was found to be an excellent medium for teaching lessons of war saving. A most comprehensive course in mixed breads was carried out by one such group. In connection with this "food conservation" institution, which has an enrollment of from 300 to 500, is a course for boys in gardening, given by a government demonstrator.

* * *

The prediction that London fogs will be entirely done away with by electricity is not based on experimentation with some new type of machine, but a result which is claimed as a future consequence of the plan to electrify all factories, railroads and households of Great Britain. This would effectually do away with smoke, and as the notorious London fog is caused by certain atmospheric conditions through which smoke is held down, London's fogs are expected to be a thing of the past.



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PERSONALS

David M. Folsom, professor of mining engineering at Stanford University, who has been appointed Pacific Coast

Fuel Oil Administrator by Mark L. Requa, is formulating valuable data that should prove helpful in assisting in fuel oil conservation. Some months ago Mr. Folsom, together with Max Thelen, president of the California Railroad Commission, and Eliot Blackwelder, professor of geology at the University of Illinois, serving as a Petroleum Committee for the California State Council of Defense, issued a book of two hundred pages on the sub-

ject of petroleum which has proved exceedingly valuable. At the San Francisco engineers' banquet to Professor George F. Swain, held at the Palace Hotel, March 20, 1918, attended by some three hundred prominent engineers, Mr. Folsom established a high degree of confidence among his hearers in his outline of the work that he hopes to accomplish in fuel administration.

R. E. Davis of the Portland office of the Pacific Power & Light Company, is absent on a two or three weeks' trip to New York.

Murray Parsons has been appointed roadmaster of the Visalia Electric Railroad, of Exeter, Cal., succeeding Samuel W. Card.

J. J. Mahoney has been elected first vice-president of the Fresno Interurban Railway, of Fresno, Cal., succeeding Paul C. Fratessa.

Joe E. King, local superintendent for the Southern Sierras Power Company, Corona, Cal., has been transferred to a similar position at San Bernardino.

C. G. A. Baker of San Francisco, vice-president of Baker-Joslyn Company, has returned to San Francisco after a visit to the Seattle branch of his company.

Norman Macbeth has been appointed secretary, treasurer and general manager of the Glendale & Montrose Railway, of Glendale, Cal., succeeding W. J. Bohon.

F. G. Beck, assistant general manager of the National Carbon Co., Inc., Pacific Coast Division, left this week for an extended business trip through Washington, Utah and Montana.

M. E. De France, formerly electrical superintendent of the Hot Springs Street Railway, of Hot Springs, Ark., is now connected with the Deming Ice & Electric Company, of Deming, N. M.

Mark Eldredge, formerly electrical engineer for the Tata Hydro-electric Company of Bombay, India, is a recent San Francisco visitor and is a guest of the San Francisco Engineers' Club.

W. L. McKinley, of the Sierra & San Francisco Power Company, has been elected president of the Monterey & Pacific Grove Railway Company, of Monterey, Cal., to succeed Charles N. Black.

G. E. Swett, formerly sales agent for the General Electric Company, Seattle, has resigned from that company and entered the employ of the Pacific Machine Shop & Manufacturing Company of Seattle. This company makes a complete line of electrical auxiliary equipment for ships.

J. R. Fairchild, master mechanic of the Western Ohio Railway Company of Wapakoneta, Ohio, has resigned to accept a similar position with the Seattle & Rainier Valley Traction Company, of Seattle, Wash.

W. R. Lyon, secretary and auditor of the Los Angeles & San Diego Beach Railway, of San Diego, Cal., has also been appointed vice-president, purchasing agent and chief engineer of the company, succeeding W. J. Gough.

M. H. Aylesworth has been appointed assistant to S. R. Inch, the newly elected vice-president of the Utah Light & Power Company, of Salt Lake City, Utah. Mr. Aylesworth is a member of the Public Utilities Commission of Colorado.

Thomas F. Murphine has been appointed to the position of superintendent of public utilities of Seattle, succeeding A. L. Valentine, who has occupied the position for the past nine years. Mr. Murphine is an attorney and has been prominent in the political life of the city for some time.

George F. Swain, professor of civil engineering at Harvard University, and the recent deliverer of the Hitchcock lectures in the Greek Theatre at Berkeley, was granted the degree of Doctor of Laws at the Charter Day exercises in connection with the recent semi-centennial celebration of the University of California.

Frederick W. Johnson, advertising manager for the Puget Sound Traction, Light & Power Company, formerly at Bellingham, Wash., has been appointed assistant to E. C. Macy, in charge of all construction for the Stone & Webster Corporation in the Northwest, with general headquarters in Seattle. Mr. Johnson has been in the employ of the Puget Sound Company since July, 1906, in various capacities.

George A. Hughes, president of the Edison Electric Appliance Co., Inc., with headquarters at Chicago, will be present at the Del Monte convention of the Pacific Coast Section, N. E. L. A. Mrs. Hughes will accompany him, and she has consented to give a paper at the women's session of the convention, on war service of electricity in the home. Those who attended the Spokane convention of the Northwest Electric Light & Power Association will recall the many accomplishments of Mrs. Hughes and anticipate much helpfulness from her presence at the convention session.

E. M. Cutting, western manager of the Edison Storage Battery Company, with headquarters in San Francisco, leaves on April 16, 1918, for the Hawaiian Islands to be gone for a month or six weeks, to take a much needed rest. Mr. Cutting has long been an active factor in affairs electrical on the Pacific Coast, and has served a term as president of the San Francisco Electrical Development League. The best wishes of the West go with him, and the hope is expressed that he will return soon after a safe and health-giving voyage to the Tropics.

Willis H. Booth, chairman of the board, Edison Electric Appliance Company, and one of the founders of the "Hot-

point" appliances, has again demonstrated his public spirited attitude. At the recent launching of the California Co-operative Electrical Campaign, Mr. Booth showed in his powerful address that confidence is the most essential factor in making for success in the new undertaking. Those in attendance—manufacturer, jobber, contractor-dealer, central station man—went away, as a consequence, with a more earnest resolve to put into practice to

a higher degree than ever before the principles of mutual co-operative helpfulness.

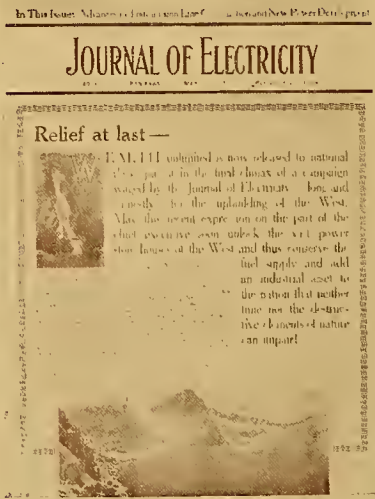


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THE JOURNAL OF ELECTRICITY has served the nation for nearly a third of a century (founded 1887).

A MILLION DOLLARS IN PUBLICITY looking toward the upbuilding of all that is good and wholesome in the West has gone forth in its pages.

AND IN THIS PUBLICITY it is conservatively estimated that fifty billion good words for the West have been disseminated throughout the entire known world.



NEARLY every progressive electrical man in the West is READING the Journal now, but we need your INDIVIDUAL subscriptions to enable us to maintain and further improve its present high standard.

The Journal is the one magazine devoted exclusively to the electrical development of the Western country, where “things are different.” It is your paper, edited and managed by men whose success is intimately associated with your own.

Not only are its issues accorded a welcome place in the universities and libraries and upon the scientific and engineering shelves of technical societies of the nation, its columns quoted in legislative halls and in the congress, but its commercial sections will be found of equal value and interest. The problems of the electrical contractor and dealer are given especial attention. In the thirty-one years of its life, the Journal of Electricity has gone forth to practically every civilized country on the face of the earth.

The vast districts served intensively by the Journal of Electricity have, according to the U. S. Census report of 1912, but 6 per cent of the total population of the United States, with the following splendid characteristics—

Comprise nearly ¼ the total area of the United States.		
Make up 1-7 of the total aggregate income of the electric lighting business.		
Require nearly ¼ of the total generating capacity.		
Have developed more than 1-3 of the total hydro-electric power.		
	The West	The Rest of the U. S.
Annual per capita consumption	527 kw.-hr.	99 kw.-hr.
Total generating capacity of power companies....	921,238	4,125,000
	(by 6% of population)	(by 94% of population)
Power and light companies' income per capita.....	\$7.50	\$3.00
Installed h. p. capacity of motors for last ten years has increased over 1000%.		
Cost of Central Station Construction and Equipment	\$593,000,000	
(Exclusive of Combined Electric Railway and Power Companies)		
Capital Stock, { Common,	\$305,000,000	
{ Preferred,	68,000,000	
{ Funded Debt,	247,000,000	
Total,	\$620,000,000	



Will you help “boost the West” by sending in your subscription and urging others to subscribe?

Important Notice

The joint convention of Pacific Coast Section N. E. L. A., California Association Electrical Contractors and Dealers, and the National Electrical Supply Jobbers' Association of the Pacific Coast will be held at Del Monte, Calif., May 9, 10 and 11, 1918 and not April 24-27 as originally planned, because the latter date conflicts with the Liberty Loan Drive.

The Jobber's Association will hold their meeting on May 6, 7 and 8. The Contractors Association will convene May 8.

The advance papers for the Pacific Coast Section N.E.L.A. meeting have been authorized for publication in the Journal of Electricity of April 1st and April 15th. These issues should be taken to the convention as no further official publication will be made.



If we don't fight the war out now we shall have to fight it over again — BUY A LIBERTY BOND



Allen H. Babcock, consulting electrical engineer for the Southern Pacific Company, has been appointed by Secretary

Daniels as Western representative for the Naval Consulting Board. Mr. Babcock's office will be at 65 Market street, San Francisco. The Naval Consulting Board has for its distinguished head Thomas A. Edison, and includes many noted Americans. Since its organization it has been busy testing and passing on thousands of inventions and devices of an offensive and defensive nature, for the use of both the Army and Navy. Many of the inven-

tions offered have been adopted, and have proven very useful. The functions of the Naval Consulting Board are best expressed in saying that it offers means whereby the government may be able to avail itself of the technical ability and native ingenuity of all of our people, by affording a direct line of communication between those who believe they have a device or suggestion of use to the government in the present emergency and the proper government officials. At the present time suggestions on the following subjects are particularly desired: Gases, both inflammable and poisonous; aeronautical devices or improvements; internal combustion motors; mines or torpedoes; submarines; ordnance and explosives; radio communication; ship construction and propulsion; life-saving appliances; aids to navigation; food and sanitation. As Western representative of this organization, Mr. Babcock will give immediate personal attention to local inventions, and is prepared to transmit all such direct to Washington. Mr. Babcock has long been identified with the engineering profession in the West, and has just recently been named by the nominating committee of the American Institute of Electrical Engineers as a vice-president for the ensuing year. His patriotic task deserves the backing of all citizens, and it is confidently expected that Mr. Babcock will have every support possible from all quarters throughout the West.

Wallace S. Clark, manager of wire and cable sales of the supply department of the General Electric Company, is a recent San Francisco visitor.

A. G. Wishon, general manager of the San Joaquin Light & Power Company, has left for a sixty day trip in which he will visit many points of interest in the East.

Elmer Jonsson, once a member of the Provo division of the Utah Light & Power Company, is now Captain Jonsson with the American Expeditionary Forces in France.

Lieut. Wm. Hoff of the Puget Sound Traction, Light & Power Company, reports that he is stationed in New Orleans as first lieutenant in the Artillery.

C. M. Brewer, manager of the Richmond, Cal., division of the Western States Gas & Electric Company, has been re-elected director of the Richmond Chamber of Commerce.

Elmer Dover, vice-president of H. M. Bylesby & Company, with headquarters at Tacoma, Wash., has been appointed general chairman of the Third Liberty Loan Campaign for the district of Tacoma.

W. D. Ward, sales engineer of the Pelton Water Wheel Company, with headquarters in San Francisco, is doing some effective work for the Council of National Defense in compiling data on water powers of the West.

H. Westbury, salesmanager Westinghouse McCandless Miniature Company, is visiting the Pacific Coast, and is now at Los Angeles with W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company.

M. J. Walsh of the M. J. Walsh Electric Company, Portland, is leaving for the East to secure up-to-date ideas to use in the new home of his company, which will, on and after June 1st, be at Fourth street, between Washington and Stark streets.

John B. Miller, formerly president of the Southern California Edison Company, has been made chairman of the board of directors for the company, while **W. A. Brackenridge** has been elected president, **R. H. Ballard** first vice-president, and **G. C. Ward**, second vice-president.

J. F. NePage of NePage & McKenny Co. of Seattle, is a recent San Francisco visitor, where his firm maintains a branch office. **V. S. McKenny**, the other member of this enterprising firm, is president of the Washington Association of Electrical Contractors and Dealers.

T. E. Bibbins, president of the Pacific States Electric Company; **H. E. Sanderson**, Pacific Coast manager of the Bryant Electric Company; **Roscoe Oaks**, Pacific Coast manager of the National Carbon Co., Inc., have recently returned to San Francisco after an interesting and profitable visit to their business activities in the Northwest states.

A. D. Page, salesmanager of the Edison Lamp Works of Harrison, N. J., and **J. C. Osborn**, assistant salesmanager, are recent Pacific Coast visitors. In company with **F. D. Fagan**, Pacific Coast salesmanager of the company, they have made an intensive study of the Northwest, and after a brief sojourn in San Francisco, have returned East via Los Angeles and other points of interest in the Southwest.

Otto W. Peterson, formerly in charge of construction on the Lake Spaulding Development of the Pacific Gas & Electric Company, is leaving for the Orient, where he will install extensive hydro-electric work at Unsan, Korea. Mr. Peterson will be employed by The Oriental Consolidated Mining Company, of which Alf Welhaven, brother-in-law of P. M. Downing, chief engineer of electric generation of the Pacific Gas & Electric Company, is general manager.

John A. Britton, vice-president and general manager, together with the entire former directorate of the Pacific Gas & Electric Company, with but a single exception, have been unanimously re-elected at a largely attended meeting of the stockholders held in San Francisco, April 9, 1918. The complete directorate is as follows: **F. B. Anderson**, **Henry E. Bothin**, **John A. Britton**, **W. H. Crocker**, **F. G. Drum**, **John S. Drum**, **F. T. Elsey**, **D. H. Foote**, **A. F. Hockenheimer**, **Herman B. Livermore**, **John D. McKee**, **John A. McCandless**, **C. O. G. Miller**, **W. G. Henshaw**, and **George K. Weeks**.

J. W. Lowrie has been appointed traffic manager of the Bamberger Electric Railroad, of Salt Lake City, Utah. Mr. Lowrie has had 21 years of railway experience in various departments. He received the foundation of his railroad training in Scotland and came to this country in 1901. Going West, he went to work in the division superintendent's office of the Northern Pacific Railroad at Livingston, Mont., and after several years of service in various departments, moved to Chicago and became connected with the traffic department of the Illinois Central Railroad, where he has been employed for the past twelve years.

E. W. Pierce, of the Beaver Electrical Company, as representative from the contracting interests; **W. H. Pickering**, maintenance electrician for the county of Multnomah, as representative of the electrical workers; and **F. D. Weber**, Portland representative of the Journal of Electricity, and chief electrical engineer of the Oregon Insurance Rating Bureau, representing the public at large, have, under the provisions of the lately adopted electrical ordinance of the city of Portland, Oregon, been appointed by the mayor of the city as a board of examiners. One of the sections of the new ordinance provides for the examination of all electrical men desiring to be rated as supervising electricians.



Do you mean it when you say the war is your first interest? — BUY A LIBERTY BOND



MEETING NOTICES FOR ELECTRICAL MEN

(Plans for spring conventions form the most interesting developments of the last two weeks. The details of the coming Del Monte Pacific Coast Section, N. E. L. A., Convention are given elsewhere. The national organization is already planning a meeting in Atlantic City for June. Hot Springs, Va., is to be the meeting place of the National Electric Supply Jobbers Association. Interesting reports of local meetings are further included.—The Editor.)

Portland Sections, N. E. L. A. and A. I. E. E.

The regular monthly meeting was held Tuesday evening, April 2d, at the Multnomah Hotel, Portland, Oregon.

Mr. John B. Fiskien, superintendent of light and power of the Washington Water Power Company, Spokane, Wash., presented a paper on "Changes in Distribution System on Account of Range Load." Mr. Fiskien's paper gave in detail the proposed distribution system for the city of Spokane, Wash., in order to ultimately handle 5000 ranges. He also submitted approximate costs and earnings from such a system. It was a comprehensive method of attacking the problem from an engineering standpoint instead of the present haphazard method of connecting on range loads to the distributing system just in order to get service without regard to cost, efficiency or future complications. Great emphasis was laid upon making the system thoroughly reliable and free from interruptions of service, and close regulation.

Mr. W. H. Lines of the Portland Light & Power Company acted as chairman.

The paper was discussed by Messrs. McMicken, Merwin, Schoofield, Quinan (of Seattle), Searing and Heaston.

It was brought out that the power companies' investment, exclusive of any investment on the customer's premises, amounted to \$100 to \$120 under present methods of handling distribution systems. The earning power of ranges averaged \$36.00 per year per customer; of water heaters, \$28.92. The best hope for the future of electric ranges was shown to be the fact that they stayed sold when once sold.

There was a division of opinion on the question of the regulation necessary for successful range operation. Some contended that the same regulation must be maintained for both light and ranges, while others contended that ranges did not require this close regulation. Mr. Fiskien used 5 per cent regulation for lights and 3 per cent for ranges. The price of gas in Spokane is \$1.40 per thousand. The Portland Railway Company is now using auto transformers on 220 volt lines to connect up ranges and have decreased the cost.

One of the facts which must not be overlooked is that gas prices may be reduced and the gas ranges made more efficient.

The meeting was well attended and thoroughly enjoyed by all present, as seldom is there a paper presented which calls forth such general interest and appreciation. A buffet lunch was served after the meeting.

The New Year Book of the A. I. E. E.

In the 1918 edition of the Year Book of the American Institute of Electrical Engineers, the names of members who are in the Army or Navy of the United States or allied nations, of which the secretary had been notified, have been designated by a special entry. The total number of members in the uniformed service, including those of which notice was received by the secretary after the Year Book went to press and up to April 1st, is 760, which is over 8 per cent.

National Electric Light Association Convention

The annual meeting of the N. E. L. A., devoted entirely

to war problems, will be held at Atlantic City, June 13th and 14th, with the Hotel Traymore as headquarters. While it is felt that it is necessary under the constitution to hold the annual meeting, the essential requirement is the limitation of work in the meeting to the consideration of pressing and vital war problems as related to the industry. In view of the fact, however, that practically all our member companies are short handed and that their officers have their time taken up not only with general problems of the industry, but with local problems and difficulties that come upon them as patriotic citizens, it is believed that the attendance at the meeting will inevitably be much smaller and more restricted than would occur in normal times and under the usual conditions; all other subjects, however important, being swallowed up for the time being in the fundamentally vital and essential one of winning the war.

The committee in charge of the convention comprises the following names from the

West: R. H. Ballard, Los Angeles; A. W. Leonard, Seattle; S. J. Lisherger, San Francisco.

The National Electrical Supply Jobbers' Association

The tenth annual meeting of the Electrical Supply Jobbers Association will be held at the Homestead Hotel, Hot Springs, Va., May 21, 22, and 23, 1918.

The Alameda County Electrical Club

The Alameda County Electrical Club held its regular monthly meeting at the Commercial Club, March 21, 1918.

Lieutenant R. B. MacPherson of the Radio School of Military Aeronautics of the University of California gave a most interesting and instructive talk and was enthusiastically applauded.

It was decided to hold the annual smoker in the near future, and President George Drew appointed a committee to make the necessary arrangements for the same.

BUILDERS OF THE WEST—XXVII



H. F. JACKSON

Never before in the history of the electrical industry in the West has a year been more productive of effective results for betterment in efficiency and conservation than the current year in utility life soon to close with the sessions of the convention of the Pacific Coast Section, N. E. L. A. Not only has this industry risen to meet every emergency thrust upon it by the national crisis, but there has been inaugurated a campaign of co-operative helpfulness in utility life that is giving to the nation new ideals in service. To Captain H. F. Jackson, president and general manager of the Sierra and San Francisco Power Company, and president of the Pacific Coast Section, N. E. L. A., this issue of the Journal of Electricity is affectionately dedicated in appreciation of his splendid service to the West in forwarding these new ideals.



You know what you think of delinquent members—BUY A LIBERTY BOND



WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.
May 7th—E. R. Shepard—"The Bureau of Standards and Electrolysis Mitigation."

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
April 19th—"Generation of Power."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. H. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Executive Committeeman-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggard, Portland.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.
Convention—Del Monte, May 8-11.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; Hof Braun Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggard-Sroufe Co., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Next Meeting: Del Monte, May 6-11.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

Nevada Section, N. E. L. A.

Chairman—Geo. A. Campbell, Reno, Nev.
Next Meeting—April 13th.

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next Meeting—Del Monte, May 9-11, 1918.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.



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New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—H. C. Morris.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m., at the American Cafe.
April 10th—Meeting called off for sale of Liberty Bonds.

San Francisco Electrical Development League

President—R. E. Fisher
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.
April 3d—Gen. C. A. Woodruff.
April 10th—Lieut. J. S. Dagger.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 50 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furmiss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club

Secretary—C. A. Blair, Los Angeles.
April 4th—George Schneiderman—"Motion Picture Photography."

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section

President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers

President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers

President—Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.

President—B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.
March 29th—Robert Lloyd—"Army Singing."

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
April 10th—Henri Grand—"Tahiti: Its Trade."

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Annual Meeting, Pacific Gas & Electric Company

An increase in Pacific Gas & Electric Company's gross revenue for 1917, as compared with the company's income for 1916, amounting to \$1,197,883.33, or 6.43 per cent, is emphasized in the report of First Vice-president and General Manager John A. Britton, presented at the annual meeting of stockholders. Discussing the company's operations for 1917, Vice-president Britton says that the increase in gross revenues for the year reflects the efforts made to obtain new business upon already existing lines, thus minimizing capital expenditures.

The increase in gross revenues of the electric department, which was 54.9 per cent of the total business of the year, amounted to \$759,752.76, a gain of 7.52 per cent over 1916.

The total gross income in 1917 was \$19,813,380.94, divided as follows:

Electric	\$10,859,785.28
Gas	7,771,058.33
Water	475,332.85
Railway	491,021.14
Steam	216,183.34
Total	\$19,813,380.94

Analyzing last year's revenues, Vice-president Britton said:

"The gross rate obtained from electric service fell off

from 1.94 cents in 1916 to 1.85 cents in 1917, due to the fact that most of the new business taken on was low-priced, being mainly industrial in character. The falling in revenue per electric consumer has been felt all over the United States."

After citing figures compiled by the Department of Agriculture on the subject of the decline in electric income, Vice-president Britton continues:

"It will be observed from these figures that the rates obtaining in the Pacific and Mountain states are lower than in any other portion of the United States, being one-half those of the New England states and about 80 per cent lower than in other parts of the country.

"Our revenue per consumer also reflects this condition, the average revenue in 1916 being \$56.54, and in 1917, \$55.87.

"The gain in consumers for the year in the electric department was 15,744, the total number of consumers of electricity at the end of the year being 194,374. Electric construction costs during the year, exclusive of charges for acquisition of Oro and South Yuba construction, were \$853,041.58 net, or \$61.20 per consumer obtained."

There was a loss last year as compared with 1916 of \$847,925.47 in net operating revenue, the reason for which is found in operating expenses of all departments. Increased



Some of you are actually making money through war conditions—BUY A LIBERTY BOND



use of fuel oil constituted one of the largest items of expense during the year.

Summing up the matter, Vice-president Britton said:

"It will be seen that oil costs, coupled with water shortage, over which we had no control, are directly responsible for the entire increased costs."

The present board of directors was re-elected with the substitution of W. G. Henshaw for his business partner, Charles T. Rudolph.

Change in Sales Organization of Bryant Electric Company

The many friends of H. E. Sanderson will be pleased to learn of his appointment as Pacific Coast manager of the Bryant Electric Company, in full charge of its business on the Pacific Coast and in British Columbia, with headquarters in San Francisco. W. A. Stacy of the Chicago office has been appointed Western manager in charge of the Middle West district and F. V. Burton, formerly Eastern manager, is now general sales manager of the company.

Compilation of Hydro-electric Data in the West

The Pelton Water Wheel Company, acting for the Machinery Builders Society of New York City, is sending out a circular letter to fifty of the more prominent hydro-electric companies in the West to gather data for the Council of National Defense.

A copy of the letter follows. The co-operation of all power companies throughout the West is urged in this matter as it is one of the means by which conservation of fuel may be the better brought about.

"We have been requested by the committee of which Mr. H. B. Taylor, vice-president of the Wm. Cramp & Sons Ship & Engine Building Co., is chairman, to write various hydro-electric companies on the Pacific Coast for data along the lines herein outlined. This is for presentation to the Council of National Defense. Contributors to the information are assured that all data furnished will be handled ethically, and that no advantages will accrue to the committee or others, because of access to the information.

"Will you please consider this questionnaire and afford such detailed and general data as you may feel disposed, although the committee appreciates that considerable of the information must necessarily be approximate.

"A list of specific water powers of which you have knowledge, giving each by name and location, together with the following details:

"1. Whether the development represents new construction, reconstruction or additions, and the approximate amount of additional power which can be developed by each of these three methods; also the character of any reconstruction. The list should include all plants in which you believe it would be practicable to increase the power by rebuilding the water wheels so as to improve their efficiency.

"2. The nature of the use to which the present power of each development listed is now applied, with special reference to the essential industries and war service.

"3. Mention of the specific war service for which the additional power can be utilized when war demands in the locality are known.

"Your co-operation will be appreciated.

"Please reply in duplicate.

"Yours very truly,

"THE PELTON WATER WHEEL CO."

New Generator Started

Officials of the Puget Sound Traction, Light & Power Company, Seattle, announce that the big turbine generator, the installation of which has just been completed at the White River plant of the company, has been started. The station at Dieringer is now capable of producing 61,333 horsepower. With the completion of a unit at the George-

town steam plant this summer, the company will be able to generate 154,000 horsepower to supply the field between Everett and Tacoma. Of this 114,000 horsepower will come from hydro-electric plants and the remainder from steam plants.

Street Lights on War Basis

An order has been issued by Mayor Hanson of Seattle, providing for the turning out of 40 per cent of the cluster lights in the city at night, leaving only those at the street corners burning. It is announced that the new plan will effect a saving of \$30,000 and will release electrical energy needed in the industrial districts. This order will be followed by an appeal to the merchants in the city to retrench in the matter of electric signs and store window lights. At the same time Superintendent of Lighting J. D. Ross will conduct a campaign for inducing people to do away with the old-style carbon bulbs and use only tungsten, which give more light and consume much less current.

Power Permits in Oregon

One hundred and five permits to appropriate water, and eight permits to build reservoirs were issued by John H. Lewis, state engineer, during the first quarter of the year 1918. These permits included the irrigation of 27,723 acres, the development of 501 horsepower, and water supply for one municipality. The estimated cost of these projects totaled \$423,390.

Colorado Power Company Stock

A new issue of \$250,000 Colorado Power Company 7 per cent cumulative preferred stock is being offered. The proceeds of the issue are to be used to reimburse the company for additions and extensions to take care of the increasing business available. A part of the proceeds will be employed in building a new and modern steam station on the company's Sterling property.

Object to Power Rate Raise

The Yukon Gold Company and the Indiana Gold Dredging Company, the former operating in Yuba, Butte and Placer counties, and the latter on the Cosumnes river in Sacramento county, filed protests with the Railroad Commission recently against the granting of any raises in rates charged them for power by the Pacific Gas & Electric Company. The Yukon company also filed a protest against any raise in rates charged it by the Great Western Power Company.

Both mining companies claim to have contracts that were entered into with the power companies at a time when the cost of power was the essential element in determining whether or not dredging operations would be undertaken.

Southern Sierras Power Completes Purchase of Subsidiary Units

Authorization of the last of four deals by which the Southern Sierras Power Company extends its field of operations and absorbs other units of the Nevada-California Power Electric Corporation's system, of which the Southern Sierras Company is one, was granted by the Railroad Commission, when permission was given the Coachella Valley Ice and Electric Company to sell its properties.

The Coachella company's transmission lines extend from Banning, Riverside county, to El Centro, Imperial county, and Yuma, Arizona. The consummation of the deal authorized by the Commission brings the Coachella Valley Ice and Electric Company, the Bishop Light and Power Company, the Corona Gas and Electric Light Company, and the Rialto Light and Power Company under the ownership of one corporation, the Southern Sierras Company having previously purchased the properties of the other three concerns.



The easiest form of service—BUY A LIBERTY BOND



LATEST IN EVERYTHING ELECTRICAL

(The efficient lighting of factories has come to be a true method of war service in its power to speed up production. The description of a new lighting unit is therefore a matter of considerable interest. Electric labor-saving devices and an electrically operated house pump which is designed for general water supply in homes not served by a city water service, are also included.—The Editor.)

A NEW INDUSTRIAL LIGHTING UNIT

A recently developed industrial lighting unit which satisfies the requirement of efficiency without blinding glare, is

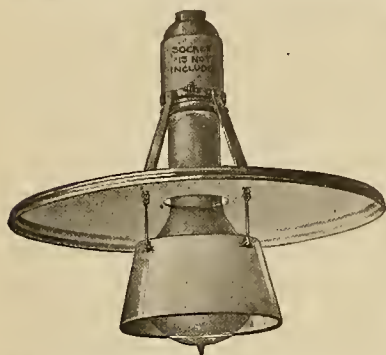
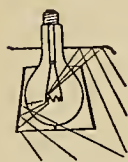


Fig. 1—The Industrolite assembled on a lamp socket

easily kept in order, is non-breakable and is the Industrolite, which is manufactured by the Luminous Unit Co., St. Louis. Each unit comprises, as shown in Fig. 1, two principal elements, both of which are formed from white porcelain enameled sheet steel. In Fig. 2 is indicated the relative arrangement of these two elements, and also how

light rays are redirected by them. The reflector element is a pan-shaped stamping of relatively large diameter. The second element is the protector, which is a cone frustum. It also is formed from sheet steel. This protector cone is suspended as detailed in the illustration, by links, which also support the reflector unit from the sustaining socket above. The principal function of the protector

cone is to protect the eyes of the worker from the direct glare of the dazzling tungsten filament. However, it also has another and a very important purpose in that it redirects, as shown in Fig. 2, certain of the light rays which it intercepts.



Practically every ray of light is utilized.

Fig. 2



Characteristic distribution of light.

Fig. 3

One feature of the Industrolite unit which is particularly worthy of notice is that it has no reflecting surface or projec-

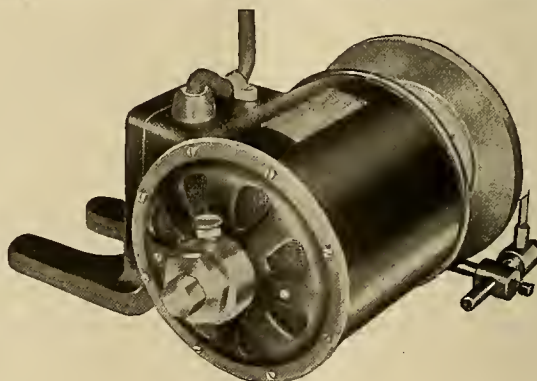
a damp cloth will restore to the reflecting surfaces their original luster and whiteness.

The fact that the installation cost of Industrolite is exceedingly low is an important factor in its favor. The Industrolite unit fits, that is, it may be hung from, any incandescent lamp socket. The labor cost is insignificant inasmuch as a boy, with a screwdriver as his only tool, can install one of the units in a few minutes.

Ventilation in the Industrolite unit is exceptionally effective. As shown in Fig. 2, the protector cone in reality provides a sort of a chimney which causes the cooling air currents as they rise around the lamp bulb to cool it. Furthermore, there is an open air space between the reflector metal and the neck of the lamp where the neck passes through the reflector.

PORTABLE ELECTRIC DRILLS AND GRINDERS

At this time, when working in metal and wood are synonymous with carrying on the war, any labor saving device which can be employed should be put to work at once. Portable electric tools which replace hand operation save time and labor and increase the output of a given working space. Particularly is this true of a portable electric drill such as that shown in the illustration. Less "elbow room" is required by a workman using one of these devices, and since he can drill a great many more holes per hour, he can replace a number of men who may be given to other tasks.



Tool-post grinder

This drill, which is manufactured by Gilfillan Brothers Smelting and Refining Company of Los Angeles, Cal., is equipped with gears to give two speeds. These are changed by means of a knob on the bottom of the gear case. The gears themselves are made of chrome nickel steel and run in grease. Ball bearings are used throughout. A ½-inch Standard chuck and a sturdy electric switch are provided. The speed range is 400 r.p.m. on low speed and 700 r.p.m. on high speed.

The same concern also manufactures a tool post grinder adapted for use on lathes. An angle plate can be clamped around the tool post. There is a vertical adjustment of the grinder provided. This grinder is equipped with a Westinghouse ¼ horsepower motor running at 3400 r.p.m. It is provided with a 6-inch by ¾-inch grinding wheel, an extension mandrel for internal grinding fitted with a 1½-inch by ¾-inch wheel, a tooth rest for cutter grinding and an electric attachment plug with 7½ feet of cord.



A chemical factory lighted by Industrolites. Ceiling height is 18 ft. Ninety 100-watt units are used

tion which will collect dust readily. The porcelain will not crack or chip as do paint enamels. The occasional wiping with

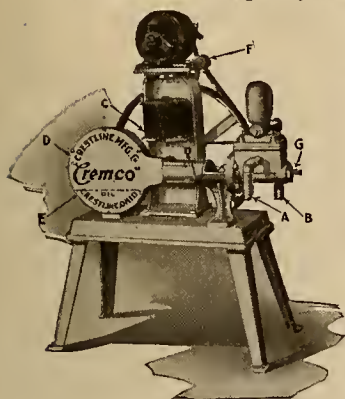


That little child of yours—what would you not do to protect its future!—BUY A LIBERTY BOND



NEW ELECTRICALLY OPERATED HOUSE PUMP

A new small capacity electric-driven pump has been developed by The Crestline Mfg. Co., Crestline, Ohio, which is especially suited to replace the common water lift to pump rain water for soft water in residences. It can also be used for general water supply in homes when city water supply service is not available and the pump can be placed so the suction lift will not be over 25 feet.



A small capacity pump

The outfit is made in two capacities — Model "A" single cylinder with a capacity of 125 gallons per hour, and Model "B" with a capacity of 250 gallons per hour. Both will operate against a pressure of 50 pounds per square inch.

An automatic controller switch is connected with the discharge and is set to operate between pressure of 40 pounds maximum and 20 pounds minimum. It can be adjusted, however, to operate at any desired pressure.

The pump gears run in oil and this same oil is automatically carried to all the pump bearings. The only oiling necessary, therefore, is to place one quart of oil in the oil chamber on starting. This will be sufficient for one year's normal service.

Model "A" is fitted with a 1/6 horsepower, and Model "B" with a 1/4 horsepower Robbins & Myers motor.

BOOKS AND BULLETINS

Elements of Fuel Oil and Steam Engineering

by Robert Sibley, editor of the Journal of Electricity and formerly professor of mechanical engineering, University of California, and Chas. H. Delany, steam power plant specialist, Pacific Gas & Electric Company; size, 6x9 in.; 320 pages; published by the Technical Publishing Company, San Francisco, and for sale by the Technical Book Shop, San Francisco. Price, \$3.00.

With the present day emphasis on steam plant economies in the interest of fuel conservation, it is of the utmost importance for those handling fuel oil in power plants to be familiar with the principles of its efficient use.

A long felt want for a not too mathematical book which treats of the elements of steam engineering from the standpoint of the user of fuel oil is filled by this volume.

Although the subject matter is treated in a comprehensive and authoritative way, it is purposely presented in a form which is comprehensible to the man who has not a technical training, so that the book may prove of service as well in educating the man lower down in power plant operation. Fundamentals of steam engineering are taken up in the first part of the book, matters which should be at the fingers' ends of engineers as well as familiar to the men who are practically handling the oil. Details of furnace operation, heat balance, boiler testing, oil specifications and the like, make up the main portion of the work. Illustrative problems for the use of classes using the book as a text are appended, as well as the summary of the comprehensive investigation on crude petroleum undertaken by a committee of the California State Council of Defense. A discussion of the various state and federal aids that have been established to forward the study of efficient use of fuel oil and its conservation, is further added. The volume is well illustrated with views and charts which add both to the beauty of the work and its value to the reader.

As John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, one of the largest

users of fuel oil in the electric field, says of the book in a letter to the authors:

"A work of this character has long been a necessity with engineers and it distinctly marks an era in the treatment of the subject, of which little is known. So far as I have been able to find time to read the book, I cannot but highly compliment the authors upon the marvelous extent of knowledge shown in the fundamental principles that govern our industry here in California, where oil must be used as fuel."

The book is intended for use by the central station man, the power plant operator, the mechanical engineer and the student.

Elements of Western Water Law (Revised)

by A. E. Chandler, president of the California State Water Commission, and president of the California Irrigation Board; size 6x9 in.; 165 pages; cloth binding. Published by the Technical Publishing Company, San Francisco, and for sale at the Technical Book Shop, Crossley Building, San Francisco. Price, \$2.50.

The first edition of this book, which made its appearance in 1912, has for many months been completely exhausted. During the six years that have elapsed, the movement for new legislation providing a rational control of water rights has notably advanced, and the courts of last resort have either established new principles or strengthened the old. In this edition the text has been completely revised, so that the changes due to new legislation and judicial opinions may be duly emphasized.

The author of this work hardly needs further introduction, since his writings on water law in the columns of the Journal of Electricity have for many years been quoted as authority from many quarters. Suffice it to say, however, that he has had a long and varied engineering experience in private practice, in the United States Reclamation Service, and in the faculty of the University of California, and today as an irrigation and water right specialist he is contributing valuable service to the West as president of the California State Water Commission and president of the California Irrigation Board.

A workable knowledge of Western water law is an absolute necessity for any one who engages in the development of the great natural resources of the West.

This book steps down the long and wearisome legal phraseology of the courts in a manner that is pleasing to read and of great value to the engineer. For a direct discussion of the elements of Western water law no better treatise can be found.

National X-Ray Reflector Booklets

A series of attractive booklets designed to cover the uses of their fixtures in various types of buildings has been gotten out by the National X-Ray Reflector Company. These are appropriately bound and beautifully illustrated and form a useful addition to the selling literature on these fixtures. Their titles are: "Correct Lighting for Schools and Colleges," "The Eye Comfort Lighting System for Offices and Banks," "The Logical Light for the Hospital," "X-Ray Reflectors for Direct Lighting—Catalogue 20," "Eye Comfort Fixtures for Indirect Lighting—Catalogue E," and a folder entitled: "Eye Comfort," published to aid advocates of good lighting."

Wiremold Advertising

An 18-page bulletin with a cover suggestive of the Saturday Evening Post has been issued by the American Conduit Manufacturing Company in advertisement of Wiremold. The book contains a record of advertisements which have appeared and which are to appear in leading magazines in the near future, and is designed to show the dealer the extent to which the manufacturer is hacking the campaign.



It is harder to be beaten than to win — BUY A LIBERTY BOND



NEW ELECTRICAL DEVELOPMENTS

(Proposed hydro-electric projects amounting to some eight million dollars in all are reported from the Pacific Central district. In the Northwest, Tacoma voted down the purchase of the street railway system. The installation of lighting systems seems to hold the center of interest in the Southwest, and new power developments in the Inter-mountain country.—The Editor.)

THE PACIFIC NORTHWEST

CHEHALIS, WASH.—County commissioners granted a franchise to the Central Light & Power Company for use of the county roads west of Chehalis.

SEATTLE, WASH.—An addition to the Georgetown power house of the Puget Sound Traction, Light & Power Company is to be constructed at once.

MONDOVI, WASH. — County commissioners have granted a franchise to the Washington Water Power Company to install electric lights here this spring.

CHEHALIS, WASH.—The question of granting to O. E. Anderson and others of Portland a franchise for the erection of a power plant here is to be voted on April 20.

TACOMA, WASH.—The city defeated the proposition of bonding in the sum of \$5,000,000 to purchase the street railway system of the Tacoma Railway & Power Company.

SEATTLE, WASH.—The State of Washington has purchased the \$350,000 in bonds voted at the last election for construction of the elevated street railway line to the ship-yards, the bonds going at 4½ per cent.

TACOMA, WASH.—Louis H. Bean, manager of the Puget Sound Electric Railway, states that the company is ready to go ahead with the repairing of the short line bridge over the Puyallup River and resume its service as soon as possible.

PE ELL, WASH.—The Central Light & Manufacturing Company has been granted the right of way by the county commissioners to erect poles and string wires along the National Park Highway from Meskill to Walville.

PORTLAND, ORE. — Northwestern Electric Company, Pittock Building, has been granted permit to erect a foundation for a fuel building at the foot of Lincoln street, to cost \$5000. Charles C. Moore & Co. are the engineers.

ASTORIA, ORE.—Bids will be received by the Port of Astoria Commission, up to April 23d, at 9:00 a. m., for the electric wiring in the bulk grain storage plant here. Certified check or draft for 10 per cent of the bid required.

MARSHFIELD, ORE.—The Umpqua Light & Power Co., which has taken over the Gardiner Light & Power Co., is preparing for installation of a new 125 horsepower steam engine in place of the 40 horsepower gasoline engine, and is making preliminary arrangements for placing a power line across the Umpqua River at Reedsport.

SEATTLE, WASH.—Authorization is to be asked of the federal government for the sale of \$6,640,000 of Seattle securities, in a resolution introduced in the city council. Included in this issue will be \$5,000,000 of lighting utility bonds for the construction of a completed hydro-electric plant, transmission line and substation, \$350,000 in bonds authorized for construction of an elevated electric railway along the water front, and other small issues.

PORTLAND, ORE.—Members of the commission went to Weston recently for the purpose of hearing an application of citizens for an extension of the Utah Light & Power Company service lines to that place so that they could secure electricity for lighting and power purposes. At the present time it is without electricity. A five-mile extension to the Utah Light & Power Company's line will be necessary to accomplish this.

PACIFIC CENTRAL DISTRICT

SAN FRANCISCO, CAL.—Improved Electric Company has moved from 510 Sheldon building to 424 Geary street.

OXNARD, CAL. — Matillia Hot Springs resort has been leased and plans have been laid for extensive improvements, one of which will be the installation of a hydro-electric plant.

SAN FRANCISCO, CAL.—The Western States Gas & Electric Company has secured a five-year renewal contract covering the electrical requirements of the Pacific Sanitary Manufacturing Company of Richmond, Cal.

SAN FRANCISCO, CAL.—A resolution declaring that the public interest demands the acquisition by the city of the United Railroads' system and prescribing a method of ascertaining the value of the property, was passed by the Board of Supervisors.

OROVILLE, CAL.—That the Great Western Power Company is ready to proceed with the construction of its \$6,000,000 Oroville plant the moment that it can be assured of government support in financing the project, was the statement made here by an official of the company. Further details have also been given as to construction plans.

SAN FRANCISCO, CAL.—Courses of instruction in the various phases of the work of the concern have been inaugurated by the Pacific Gas & Electric Company for its 1000 employees. Under the direction of the head of each department, lectures will be given in such subjects as gas engineering, electrical engineering, finance and accounting.

SAN FRANCISCO, CAL. — Application has been filed with the Railroad Commission by the Sierra & San Francisco Power Company for authority to issue \$1,000,000 in bonds, the proceeds to be used for the construction of an additional hydro-electric plant on the middle fork of the Stanislaus River, the construction of storage reservoirs on the middle or the south fork of that river, building additional flumes, ditches, etc.

OAKDALE, CAL.—The Oakdale irrigation district now has an irrigation system valued at \$2,677,000, according to the annual report. The district now has the system in shape for running of water, but with the frequent rains there has been no demand for irrigation and it may be another month before any call is made for service. In the meantime the Sierra and San Francisco Power Company is rehabilitating its plant at Knights Ferry, and the irrigation water will be used to manufacture power.

VALLEJO, CAL.—An electric lighting and power system capable of serving a city four times the size of Vallejo will be installed by the Vallejo Electric Light & Power Company, according to the officials of the company. The immediate improvements planned in connection with enlargement is the construction of a second pole line from South Vallejo to the power plant at the foot of Kentucky street, the installation of new and larger transformers and the addition of much new electrical equipment at the Kentucky street station. Application has already been made by the company to install a system of poles throughout the city.

PLACERVILLE, CAL.—George E. Loughland, superintendent of construction of the \$1,000,000 project which the Western States Gas & Electric Company is developing in the



Why leave it for the next generation to win a second war?—BUY A LIBERTY BOND



summit of the Sierra Nevada Mountains, in El Dorado, Alpine and Amador counties, said that work would be begun this year as soon as possible. The company proposes to develop 8000 acre feet of water for power purposes at Twin Lakes, which will be obtained by the installation of a big dam. Considerable work on this project was done last year in work at Desolation Valley. The corporation intends to appropriate about 20,000 acre feet of water by their improvements, and the officials estimate this will develop about 40,000 horsepower. It is planned to construct a large power house on the American River, 14 miles from this city, to supplement the power house now in operation near Placerville.

THE PACIFIC SOUTHWEST

PHOENIX, ARIZ.—Plans are now under way for the reconstruction of the power house at the state hospital for the insane, and actual construction will begin at once.

SANTA FE, N. M.—The Columbus Electric Light & Power Company has purchased new equipment, which will be installed in the new building to be erected for the purpose.

LONG BEACH, CAL.—Work has begun on the erection of a new substation at East Wilmington Junction for the Long Beach, San Pedro and Los Angeles-San Pedro lines of the Pacific Electric Company.

SANTA ANA, CAL.—A petition has been filed with the city council by property owners on Lincoln street, north of Seventeenth, asking that lights be installed. A committee was appointed to investigate.

MANHATTAN BEACH, CAL.—The board of trustees has awarded a contract for reinforced concrete lighting posts and appurtenances to be installed on a portion of Highland Avenue, to O. Alvord Nichols, on his bid of \$108.50 each.

CLOVIS, N. M.—Mountain States Telephone & Telegraph Company has promised to put in a modern exchange at Clovis at an expense of \$50,000, as soon as the city has granted it a new franchise. The city council has announced its willingness to give the franchise.

LOS ANGELES, CAL.—The sum of \$79,000 has been provided for the building of distribution lines for the city's Aqueduct hydro-electric power to all parts of the harbor section. Of this amount \$34,000 will be used to extend the power lines of Fish Harbor on Terminal Island.

AZUSA, CAL.—Work will be commenced in a very short time to provide the big government school at Arcadia with electric power and light, gas and electric transportation. The Southern California Edison Company will supply power and is planning to bring new lines to Santa Anita rancho.

SAN DIEGO, CAL.—Improvements to be made at North Island include the building of a standard gage railroad running from the North Island bridge-head along the southerly side of the proposed paved boulevard. The sum of \$24,000 has been appropriated for the construction of the railroad. Later it is to be electrified.

LOS ANGELES, CAL.—The contract for ornamental lighting of Broadway, between the tunnel and Tenth street, has been awarded by the board of public works to the Keystone Iron Works. The total cost of the improvement will be \$65,985. The new posts will be 27 feet high, each equipped with two inverted arc lights.

LOS ANGELES, CAL.—It is stated that the fuel administrator will make a formal request that the city employ the \$1,877,000 left in the power distribution bond fund to build additional hydro-electric power houses. One of these is said to be in San Francisquito Canyon, another is to be located at the foot of the Cascades, in the upper San Fernando Valley, and a third in Franklin Canyon, Hollywood.

LOS ANGELES, CAL.—Plans and specifications for competitive bids for ornamental lighting of more than 50 miles

of Los Angeles streets have been approved by the board of public works and forwarded to the council for the passage of ordinances. A resolution has also been submitted to the council for supplying of Aqueduct power for ornamental lighting of Broadway from California to Tenth street. The municipal power bureau will be awarded this contract, as there were no bids submitted when called for by the board. The contract amounts to more than \$30,000, as the globes and other equipment for the elaborate lighting scheme on Broadway will be included.

THE INTER-MOUNTAIN DISTRICT

KENTERVILLE, IDAHO—The Kenterville Telephone Co. has been incorporated here.

WINNEMUCCA, NEV.—H. H. Alexander who has a ranch north of Jungo, plans to pipe water from the mountains and to install an electric plant, utilizing the water for power.

MONTROSE, COLO.—The ordinance granting the Western Colorado Power Company a new 20-year franchise to operate in Montrose has passed its first reading in the council.

BOISE, IDAHO—No definite result has been reached by the city council regarding a new lighting contract for the city. A full investigation of the lights and cost will be entered into before a contract is signed.

RONAN, MONT.—Negotiations are under way between the council and the Mission Range Power Company of Polson for an extension of its transmission lines to Ronan, a distance of about 14 miles, to furnish electric service here.

HARLEM, MONT.—The contract for the installation of the new ornamental lighting system in Harlem has been awarded to the Electric Construction Company of St. Paul, Minn., at \$4,550.

COLUMBUS, N. M.—The Columbus Electric Light & Power Company, it is reported, contemplates the construction of an electric light and power plant to supply electricity in Columbus and Camp Furlong. The cost of the proposed plant is estimated at about \$30,000.

SALT LAKE, UTAH—A delegation of property owners has presented a petition to the county commission asking that the county lighting system be extended to Draper and Riverton. The matter will be referred to the county electrical engineer for investigation and estimate of cost.

GRANGEVILLE, IDAHO—Work is under way on the construction of a large dam on Clearwater River, eight miles from Grangeville, which when completed will double the output of the present plant. The dam is in circular form, 400 feet long and 20 feet high, and, it is estimated, will develop about 1600 horsepower.

VERNAL, UTAH—Application has been filed with the state engineer by Charles B. Bartlett of Vernal for the use of 40 second feet of water on Whiterocks Creek in Uintah county. The plans provide for a development of 950 horsepower to be distributed in and near Lapoint. The power will be developed through three 6 foot wheels under a 286 foot head.

GOLDFIELD, NEV.—The Nevada Valleys Power Company has consummated a deal with the Beowawe Electric Light Company by which the ownership of the plant at Beowawe passes to the former company, which owns and operates the plant at Battle Mountain. The plant will be shipped to Battle Mountain and rebuilt as an addition to the plant now there.

LEWISTON, IDAHO—R. S. Rice, president of the Union Copper Mining & Smelting Company, which company has been presenting the project of developing a hydro-electric power plant on the Salmon river, announces that it has been financed and will develop 62,000 horsepower. The chief object is to erect an electrolytic smelter for reduction of copper ore near Horse Show Bend.

Ad-itorial Comment

(A noteworthy feature of the advertising section in this issue is a new departure, "Ready Reference for Western Buyers." This is made up of cards from jobbers and manufacturers located in Pacific Coast cities. Such listing is indicative of the recognized fact that advertising is a great necessity at the present time, even when service facilities are being employed for governmental purposes. The firms advertising now have prevision of after-the-war business and are making proper provision to receive their due share. —The Aditor.)

Landers, Frary & Clark pictures the various Universal heating devices which are good sellers for gift purposes.

Electric Service Auto Company, a new advertiser in these columns, announces a universal fuse and circuit tester.

American Vulcanized Fibre Company recommends the use of "Vulcot" for electrical insulation.

Wells-Morris Manufacturing Company advertises a new starting switch for motors up to 5 horsepower.

Federal Sign System (Electric) states the latest attitude of the Administration in encouraging the use of electric signs.

The Robbins & Myers Company employs a striking cut-out to illustrate the strength and rigidity of the R. & M. fan.

Hurley Machine Company again advertises the Thor washing machine as an efficient labor-saving device in the home.

Benjamin Electric Manufacturing Company calls attention to the day-load building ability of the Benjamin two-way plug.

Westinghouse Lamp Company invites contributions to its series of "How I Did It" stories.

Edison Storage Battery Supply Co. emphasizes what the Edison storage battery is accomplishing as an off peak load builder.

Hotpoint Division, Edison Electric Appliance Company, displays the features of the Hotpoint Iron which make it easy to sell.

The Electric Storage Battery Company tells of the advantages of electric industrial trucks equipped with "Ironclad-Exide" cells.

Moloney Electric Company cites a 5000 kva. water cooled type of transformer as one of thousands giving efficient and reliable service.

Sprague Electric Company advertises wiring supplies for every requirement, particular emphasis being placed on BX flexible armored cable.

Pacific Electric Manufacturing Company has issued a valuable new series of bulletins on high-tension switching practice, which will be sent to interested parties.

Western Electric Company reproduces an effective advertisement of its portable sewing machine, which is helping dealers to sell to housewives throughout the country.

The American Conduit & Manufacturing Company features its campaign for introducing Wiremold into general use and shows how the contractor can benefit therefrom.

Hubbard & Company gives detailed lists of pole line hardware and Peirce specialties carried in stock by the Pacific States Electric Company.

Crouse-Hinds Company features the ZY conduit as "the last word in small motor switches."

Garland-Affolter Engineering Company features Howell polyphase motors and Peerless fans.

Jeffery-DeWitt Company tells the reasons why the Jeffery-DeWitt suspension insulator puts an end to high tension line insulator troubles.

Habishaw Electric Cable Company presents an excerpt from its current advertising whereby it is educating the people in the electrical idea.

Allis-Chalmers Manufacturing Company illustrates a powerful electric hoist and calls attention to special features of design and construction.

Cutler-Hammer Manufacturing Company suggests the use of C-H rectangular magnets as a most efficient means for conserving man-power.

Condit Electrical Manufacturing Company offers to send engineers a valuable booklet on "The Control and Protection of Small Induction Motors."

Youngstown Sheet & Tube Company patriotically devotes its regular advertising space to an appeal for men to enroll as U. S. shipyard volunteers.

National Carbon Company, Inc., lays stress upon the fact that "National" electrodes have kept pace with electric furnace developments from the start.

Century Electric Company emphasizes the smooth-oscillating feature of Century fans at all speeds, due to the ball-bearing motor support.

The Locke Insulator Manufacturing Company advises of local stocks at convenient points in the warehouses of the Pacific States Electric Company.

Baker-Joslyn Company shows how Macomb insulators conform with the recommendations of the engineering committee, Pacific Coast Section, N. E. L. A. Attention is also directed to the ease of handling and economy of storing Duraduct packages.

Westinghouse Electric & Manufacturing Company uses the Denver installation of Westinghouse voltage regulators to exemplify their ability to reduce costs of line construction. It also advises that the selection of a condenser be based upon a study of individual plant conditions.

General Electric Company advises the use of G. E. porcelain sockets for exposed installations. Special emphasis is placed on the sales help accorded to dealers by the "1918 G. E. Fan Cyclone." A picture of oil circuit breakers in operation after a severe snow-storm shows their fitness for outdoor substation use. An excellent view is also given of the 60,000 kva. Volta plant of the Montana Power Company, which is equipped with G. E. water wheel driven generators. Another page is devoted to telling of educational advertising regarding the dependability and economy of Edison Mazda lamps.

In This Issue: New Ideas in Co-operative Retail Selling

JOURNAL OF ELECTRICITY

VOL. 40 NO. 9

SAN FRANCISCO, MAY 1, 1918

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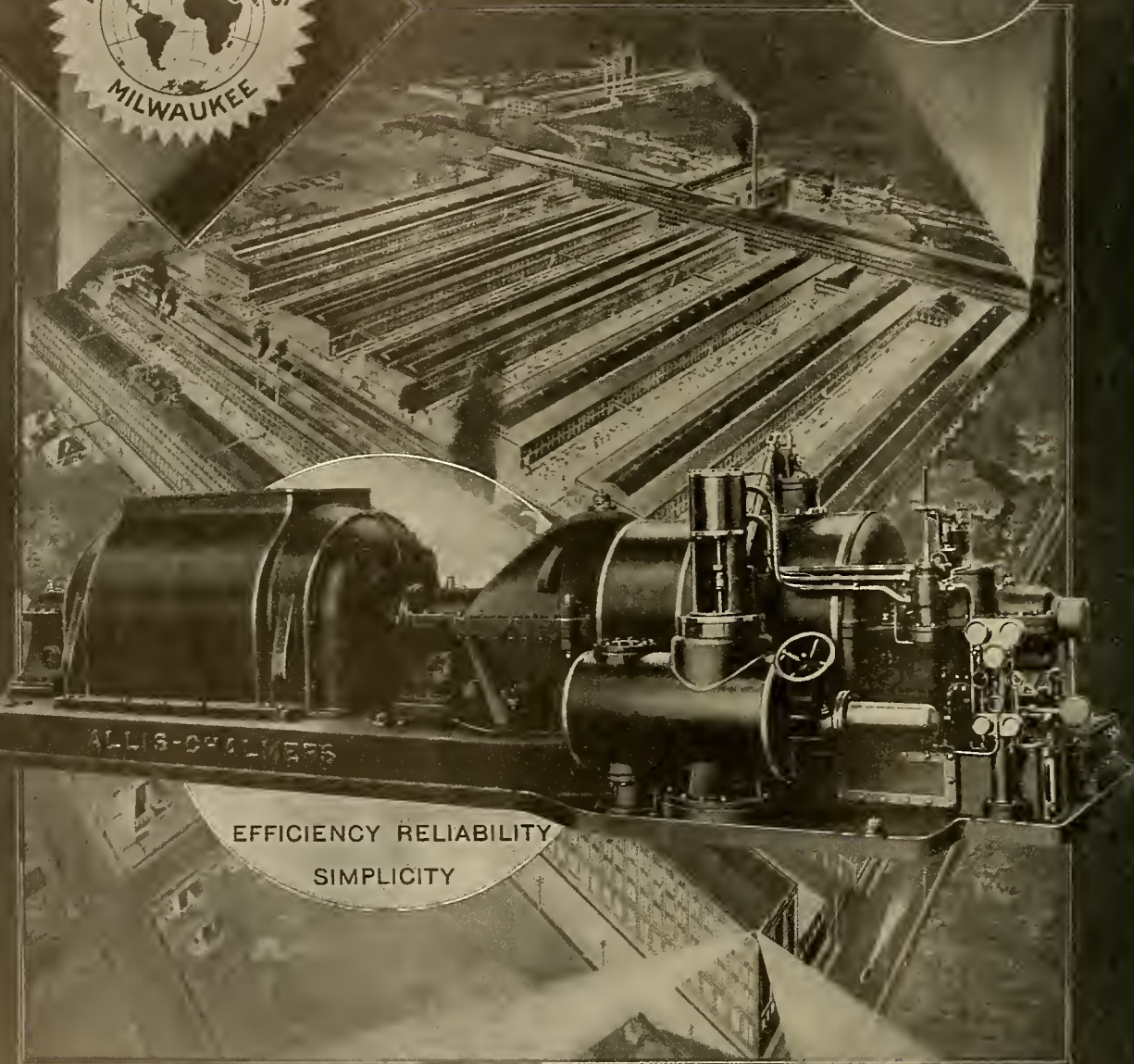
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(305)





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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, MAY 1, 1918

NUMBER 9

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AN INSPIRATION AT DEL MONTE FOR ELECTRICAL MEN

Far beyond the memory of man—some say as far back as the dawn of civilization—the gnarled and twisted Monterey cypress have stood sentinel, overlooking the vast Pacific. Throughout this entire expanse of time the beautiful laws of electricity have been living realities, yet it has remained for our generation to put these laws to the service of man. Did it ever occur to you that the laws of mutual helpfulness have also existed throughout this self-same expanse of time and that it is possible for this generation

to apply these laws, too, for the service of man. Until the combat of conflicting principles—domination by a few over the many, as opposed to mutual helpfulness and co-operation—is fought out to a finish, there will be world war. What greater service can our industry give to the nation than a living example of what “everlasting team work” can accomplish. The opportunity is yours at the Del Monte Convention—manufacturer, jobber, central station man and contractor-dealer—make the best of it.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, MAY 1, 1918

Number 9

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WIN-THE-WAR SPIRIT EVERYWHERE



It is not generally recognized that the spirit in which we go about our daily affairs with respect to the outcome of the present world crisis has a very decided effect in molding and shaping the final outcome.

The Department of Commerce at Washington is far-sighted enough to see this important factor in world affairs and is sending out broadcast the suggestion that the win-the-war spirit be made to enter business affairs to such an extent that it actually permeates through and through the business letters of the nation.

Let the American business man make known to the whole world that he is for this war and that he is going to see it through regardless of inconvenience, loss of trade, loss of money, or anything else, and we shall need no longer to have the slightest possibility of a doubt as to the ultimate outcome of the great war for democracy.

Men in the electrical industry throughout the West can do much to forward this overpowering win-the-war spirit that is now enveloping the business affairs of the nation. It is of the utmost importance that the American business letters breathe confidence in every line. Why not begin tomorrow and scan your letters most critically and see to it that no written expression be allowed to leave your hand that does not emphatically voice the win-the-war spirit.

Seldom has a representative gone forth from the West and accomplished in so short a period such telling results as has W. L. Goodwin, formerly intimately connected with affairs electrical on the Pacific Coast, who has during recent months proved himself a powerful factor for good throughout the nation in evolving a helpful system of co-ordination in the field of the electrical contractor-dealer. In recognition of this nation-wide service we welcome Mr. Goodwin in our midst.

A brief review of some of his recent labors is interesting and timely. The new constitution of the National Association of Electrical Contractors and Dealers, agreeable to the "Goodwin Plan," was put into effect officially on January 22, 1918, when the old form of organization was formally turned over to the national chairman representing the new form of organization.

The transfer did not abolish the old organization but changed its name and form of government, retaining in its fold all members in good standing who belonged to the former organization.

The effective launching of this great organization so expressive and so all-comprehensive for all those who have to do with the merchandising of electrical ware, means much for the future of the industry.

According to the By-laws of the new organization—the National Association of Electrical Contractors and Dealers—any person, firm or corporation doing electrical construction or repairs, or selling electrical supplies, merchandise, appliances, fixtures or apparatus at retail, is eligible to membership.

This definition would include manufacturers, central stations, jobbers, contractors, dealers, department stores and hardware stores who sell electric material direct to the consumer. This work in the formation of the National Association of Electrical Contractors and Dealers is but the beginning of a greater movement contemplated to follow later looking toward an advisory committee from the four branches of the industry to give balance to the working of the whole.

In the formulation of this all-inclusive organization, it must be admitted that a gigantic stride forward has been accomplished. The constructive work of Mr. Goodwin deserves the hearty support of all branches of the industry.

The Home-Coming of W. L. Goodwin

This is the day for definite aims in organization. People have not time to be "joiners" merely. Coming then to a consideration of the various leagues throughout the West that have been formed for the development of the electrical industry, it is well that publicity or development work itself be put in the background during the coming months, and that more active effort be given to forwarding the world problem of winning the war. Second in importance should be the problems relating to increasing the efficiency of the industry in its present state of development; and third, new electrical development.

In a word, organizations of this nature would do well to adhere to three ideals in the following order of importance: War service, co-ordination and co-operation between the different branches of the electrical industry, and lastly, electrical development.

The rules for conducting evaporative tests of boilers, as drawn by the Power Test Committee of the American Society of Mechanical Engineers, are proving each day that the immense amount of detail, time and effort involved in their compilation has completely justified itself.

At the invitation of the Power Test Committee, the authors—Robert Sibley and Chas. H. Delany—of the series of fuel oil and steam engineering articles that have been appearing in the columns of the Journal of Electricity during the past year, have submitted for the consideration of the committee proposed additions to these rules in order to more clearly define the rules for boiler tests when boilers are oil fired.

In these tables the item numbers have been retained as far as possible to correspond with the item numbers in the code of 1915. The principal changes consist in the following: The omission of reference to grates and grate surface and substituting therefor the number of oil burners and dimensions of furnace; the omission of reference to ash, combustible, firing data, etc., but introducing instead items connected with the steam used for atomizing the oil at the burner. The term "net efficiency" is also introduced, by which is meant the efficiency of the boiler obtained by deducting from the total evaporation the quantity of steam used by the oil burners. While this tabulation refers particularly to boilers in which the oil is atomized by steam, the same tables can be used for tests in which the atomization is obtained by other means, by simply leaving blank in the report of the test the items referring to the steam used by the oil burners.

In addition to the tabulations submitted, the writers have suggested that the appendix in the Code Rules be amplified so as to include a description of methods for obtaining gravity of oils, flash point, the water content and the viscosity. These determinations could be fully described and included in Appendix No. 14, beginning with paragraph 287 under the heading "Analysis of Liquid Fuels."

They have submitted a proposed form for tabulation of fuel oil test data, which has been made up to correspond as nearly as possible with the code of 1915 for boiler tests as published in Volume 37 of the trans-

actions. Two tabulations are included, Table No. 1 covering the full report of a test of oil fired boilers, and Table No. 2 giving the principal data and results.

For several years past there has been a decided need in the West for just such revised rules as these. It is not known as yet whether the Power Test Committee will go into these suggestions in the detail that would forever clear up conflicting ideas on boiler tests, when oil fired, that have in the past caused considerable controversy.

It is to be hoped the matter will receive full detailed consideration, and that all engineers interested will see that the entire subject receives the fullest discussion possible.

We hear a great deal about co-ordination in the various fields of endeavor—the manufacturer, the jobber, the electrical contractor-dealer, and the central station. And in the ultimate analysis co-ordination of activity is found to play an immense part in the merchandising of electrical work. Proper merchandising does not mean what the other fellow does, but what each does as an individual in a collective way.

The man who wins in life is the one who can stand the bumps and get some benefits out of them. In reality, men with broad vision nowadays look beyond the petty trials of the passing moment and cast their vision off into the future, where they see that the bumps encountered, if diligently disposed of each day, is merely the sorting or co-ordinating process actually getting under way in one's daily business affairs.

Take, for instance, a box of unassorted pebbles. Upon shaking and jarring and jolting these pebbles soon shake down, the small ones going to the bottom, the large ones to the top, with the intermediate sized ones graded between these strata. And there eventually comes a time when jars and jolts can not further disturb the stability of the assorted mass. Such indeed is true co-ordination.

And so in the great problems that are open for solution today in the electrical industry, especially along the lines of effective merchandising, the bumps must be met, but the real vital factor is, are you properly handling each daily difficulty so that your business life is more productive by this eternal process of co-ordination.

The electrical contractor-dealer, who is each day coming more and more into the limelight as a factor in the electrical industry, is finding that cost accounting is a necessity in his work.

The Cost of handling Small Orders

Every business house is eternally vexed with the problem of handling small orders. In the electrical industry, due to the vast expansion of business during recent years, some of the larger companies have found the small order of increasing vexation. One of the large manufacturing companies, for instance, has found that the average routine cost of handling and billing an order is in excess of three dollars. Hence there seems to be a similarity in the demand for a minimum charge in the merchandising

of electrical ware to the meter service charge in the sale of electrical energy.

It is interesting to note how this perplexing question is handled by one of the large manufacturing concerns. One large manufacturer has recently announced that when the value of apparatus shipped is less than one dollar, the invoice will be issued at a net price of one dollar, as it will be the established policy of the company in the future not to issue any bills for less than this amount.

The experience of the manufacturer may well serve to warn the electrical jobber and contractor-dealer to give more thought to the small order accounts. And, too, it brings to light the further necessity of accurate cost keeping, as only by this means can the jobber and contractor-dealer know just how to profitably handle the small order business.

There is perhaps no other industry more affected by safety standards in the household than is the electrical industry. So completely is every phase of modern domestic life interlinked with the details of the home that Circular No. 75, just published by the Bureau of Standards, on the subject of safety for the household, is of great timely importance.

Safety for the Household

In brief, the circular contains an interesting account of household hazards. The topics are discussed clearly in a manner which affords a basis for popular education in "Safety First." The dangers from electricity, gas, fire, lightning, household chemicals, and the other common causes of accident are recited, and many actual cases are described. The purpose is to aid in removing needless risk and fear, and to develop intelligent caution where the hazard cannot be entirely avoided.

During recent years the National Electrical Code published by the National Board of Underwriters, has done much to standardize electrical installation in the home and to make installation of increasing safety. To the popular mind, however, the rules contained in this excellent code are generally too technical for ready application in the average household.

Looking deeper into the subject it is easily seen that caution alone is not enough, since many of the dangers are not even suspected. The nature of such unknown hazards must be made plain. This circular emphasizes the seriousness of some of the risks not generally known, gives sample cautions, and aims to guide the formation of habits of carefulness. The circular also suggests effective home equipment to minimize the risks involved, and aims to encourage public measures to provide safety for the household

and community. It is sold for fifteen cents, and may be purchased by remitting this amount to the Superintendent of Documents, Washington, D. C.

The widespread distribution of this new publication of the Bureau of Standards is most desirable. The prevention of loss of property and life from avoidable causes is one of the real constructive ways that each citizen may help in the national emergency. And at the same time such a citizen helps most effectually in forwarding the electrical industry to an even higher plane of usefulness to the human race.

Much is written in these momentous days on the necessity for reciprocation, co-ordination, affiliation, unification, synchronism, and even on synergism, or that which deals with the combined healthy action of every organ of a particular system such as that of the electrical industry.

Consolidation

This gospel of getting together and making a more efficient and useful industry is being preached and practiced in the commonwealths of the West perhaps to a greater degree than in any other section of the nation.

Along this line it is interesting to note that progress is being made in many of the great districts of the West looking not alone to interconnection of power lines but in consolidation of managerial organization.

Ever since the regulatory bodies of the various commonwealths of the nation have gone on record that duplication of service is to be avoided in utility evolution, thoughtful men have been coming more and more to the conclusion that interlinking of electrical activity, both physically and managerially, is the crying necessity of the hour for economic supply of power.

It is admitted on all sides that epochal economic and social changes will result from the present war. That structure alone which is built upon laws of fundamental economic design can withstand the new era now upon us. To this end all jealousies of competing organizations must be laid aside and the impersonal view of the bigger problem—the best and most economic service possible—must be held before the vision at all times.

The past year has witnessed much centralization of utility managerial activity throughout the nation. All these great movements that look toward the bettering of industry, of the worker, and of the public served, are founded upon indestructible principles and should be encouraged.

THE NEW JOURNAL SERVICE: Arrangements have already been perfected for excellent service in collecting and collating the important discussions that are to take place at the Del Monte Convention, Pacific Coast Section, N. E. L. A., May 9-11, 1918, so that readers of the Journal of Electricity may have this excellent matter in the issue of May 15, 1918. The issue for June 1, 1918, will feature the engineering and commercial development of China—a development that is becoming increasingly important in the West—so important that one Pacific Coast port alone sent out a hundred million dollars of trade exports during the past year.

Attention is called to a new departure in advertising service initiated in the issue of the Journal of Electricity, April 15, 1918, under the heading of "Ready Reference for Western Buyers." This listing of manufacturers and distributors of electrical products is a helpful and convenient reference of great value to our readers.



We have said nothing concerning the Third Liberty Loan Campaign in this issue, because we take it for granted that every electrical man has not only bought a bond—but will buy another if it lies within his power.



A CO-OPERATIVE VACUUM CLEANER CAMPAIGN

BY H. H. COURTRIGHT

(A campaign instituted by a contractor-dealer of Fresno, which enlisted the help of all other dealers in town and the support of the central station's organization, marks really the first step in the practical application of co-operation in the industry. Of course the campaign was a success, as this interesting report of its handling indicates. The author is manager of the Valley Electrical Supply Company of Fresno, Cal., and the originator of the campaign.—The Editor.)

What really started me to thinking of an electric vacuum cleaner campaign was that in the year 1916, almost every electrical magazine ran some advertisement of how some power company had put on a year's campaign of a certain make of electric vacuum cleaner, and had disposed of from three to five hundred machines (a gross sale of from twenty to thirty thousand dollars).

The twenty to thirty thousand dollars certainly looked good to me, for the largest sale we had made on electric vacuum cleaners in one year was \$480. Still I felt that by concentrating all our efforts on one make of cleaner, and putting on a salesman to specialize on that one line, we were bound to sell more sweepers. But the question was, would it pay? I called on the San Joaquin Light & Power Corporation to see what help I could receive from them should I launch this campaign. I put the proposition in this way—that we would advertise the campaign as the San Joaquin Light & Power Corporation campaign, and not the Valley Electrical Supply Company, but make all the sales and contracts through the Valley Electrical Supply Company, for the reason that I felt that the name of the San Joaquin Light & Power Corporation back of a campaign would mean more to the public. This was satisfactory with the power company, as you see by the photo of their building.

The next question was, "What vacuum cleaner should we handle?" After considering every make of electric cleaner that we could find, we decided to take the one which we felt was the best electric sweeper on the market. A further consideration was that it is made in four different sizes, and by advertising this make we could cover the sweeping game from the smallest home to the largest hotel.

Now came the financial end. The sweeper company would not give a credit for more than 30 days after receipt of goods. I handled this through our bank in this way. We would purchase 100 sweepers at a time, and upon their receipt we would issue the company a six-month bankable note for same, carrying interest at 6 per cent. By doing this the sweepers cost



CENTRAL STATION ADVERTISING

With the idea that the public would know that the power company could not afford to back a sweeper they could not guarantee, the campaign was put on in the central station's name.

us 6 per cent more than they would had we paid cash, so we let the purchaser pay for this difference in this way: All sweepers that were sold for cash would be sold at the regular retail price of the sweeper com-



THE DEMONSTRATION ROOM

The attractive demonstration room of the Valley Electrical Supply Company was the center of the campaign—but the sweeper was pushed by every dealer in town. If a customer called on any dealer for a vacuum cleaner, he recommended the same make. gave her reasons why he thought it the best and offered to call at her home and demonstrate the machine to her. This co-operation seemed to give the public more confidence in both the dealers and the power company.



THE BOOTH OF THE VALLEY ELECTRICAL COMPANY AT THE FOOD SHOW

The dealer and the power company each paid half of the expense of this booth—but it was called the San Joaquin Light & Power Corporation booth. Note the service signs on the posts.

pany, but the sweepers that were sold on terms (\$5.00 down and \$5.00 per month) were to have the interest that we were paying the bank added to the retail price.

The sweeper company furnished us with their special salesmen, whose salary was 10 per cent commission on the retail price of all machines they sold.

Next came one of the most important factors—the newspaper advertising. The San Joaquin Light & Power Corporation turned over their advertising man and all their advertising space to suction sweeper ad-

sumers, and these names were laid out in districts, so the salesman could work the house-to-house system and know the lady's name he was calling on. The



MAIN OFFICE OF THE POWER COMPANY

The central station backed the campaign—as can be seen by the sign which encircles the office.

vertising only, with great results. They started with a full page in both the local papers, and then cut it down gradually to a three column, eight inch advertisement. This was kept up until September, and then two large ads were put in to stimulate the sales again.

Before starting the campaign I called on all the electrical contractor-dealers in Fresno and explained the campaign, and asked if I could place a sample machine in their store, so that when they had a call for a sweeper they could make the sale. These machines were sold to the dealers at my cost. When we started the campaign, all the electrical dealers dressed a window with the suction sweeper.

Before starting the salesman out, he was given the names and addresses of all the power company con-



THE APPROACH TO CUSTOMER

The power company's name appeared even on the car. Everything about the equipment was very neat—demonstrating carpet, sand, cotton batting, dust cloth and oil can being stowed away in the little grip.

salesman would look for the number of a house, then compare it with the number in his book, and in this way he would find the lady's name. When Mrs. Smith appeared, the salesman would introduce himself as a "San Joaquin Light & Power Corporation representative," who was sent out to call on her and demonstrate the wonderful vacuum cleaner in whose interest the power company was putting on a campaign, and which they were selling for \$5.00 down and \$5.00 per month. She would immediately let him in and give him plenty of time to demonstrate his machine.

All the power company consumers in Fresno were called on in this way. In the power company districts outside of Fresno, the power company district agent co-operated with us in every way possible. The results for the year were that the Valley Electrical Supply Company sold in Fresno and the surrounding districts 426 suction sweepers, a sale of \$28,500—some difference between this and \$480 for the year before.

This could never have been accomplished without the co-operation of the San Joaquin Light & Power Corporation and all the electrical contractor-dealers.

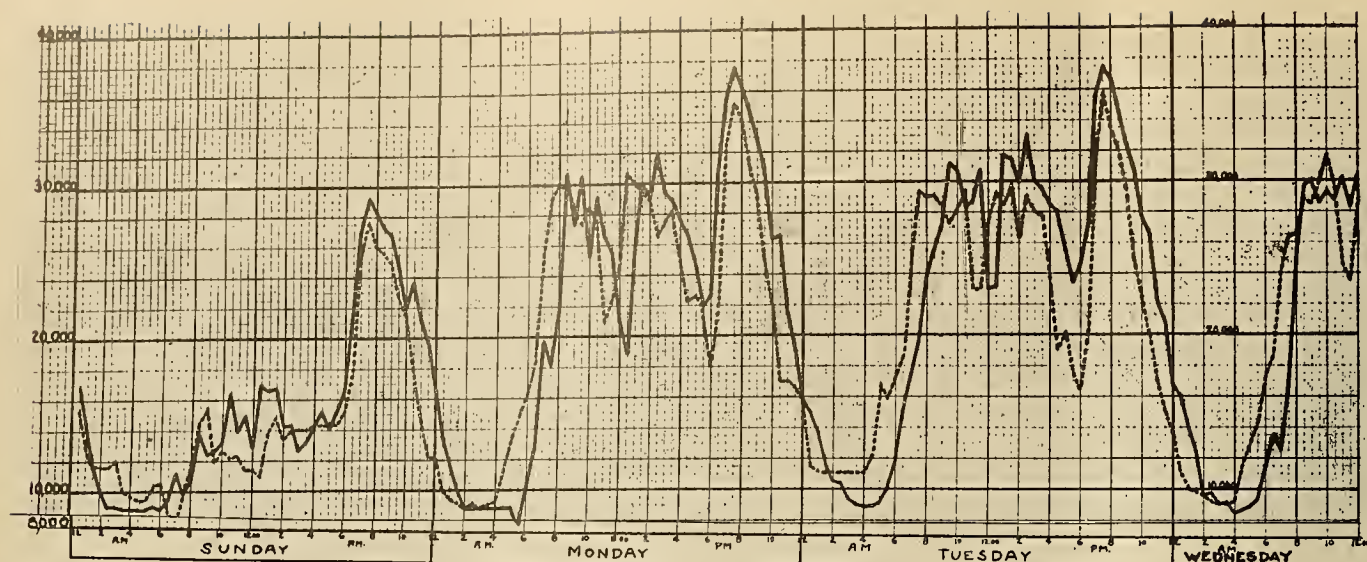


CHART SHOWING EFFECT OF DAYLIGHT SAVING
 — Week of March 24-30, 1918; Week of March 31-April 6, 1918. (Daylight Saving time in effect 2:00 A. M., March 31.)

“DAYLIGHT SAVING” AND CENTRAL STATION LOAD

BY W. G. VINCENT, JR.

(A saving of nearly seven and three-quarter million kw. hr. with a reduction in revenue of approximately \$350,000, with but \$10,000 saved in company expense, is the toll that the Pacific Gas & Electric Company must pay for the recently inaugurated daylight saving enactment. The discussion which follows is contributed by the valuation expert for the Pacific Gas & Electric Company, and adds timely information on this much-mooted question. This discussion points forcefully to the fact that to be completely effective the daylight law should be extended throughout the remaining months of the year. An interesting side-light study of this curve shows that the domestic uses of electrical energy in the home, such as cooking, may in the future be termed a war service, in that labor and fuel are saved and the idle water power during this period of the day put to useful and profitable work.—The Editor.)

The effect of the recently adopted plan to conserve daylight on the operation of electric utilities has been the subject of a good deal of discussion, especially among those operating such properties. Before the plan went into operation there was a great deal of speculation as to how it was going to affect the electric lighting business and particularly what reduction in revenue would result, what the savings in fuel and fuel expenses would amount to, and what changes it would make in the load curve.

This speculation was caused by a doubt as to whether the habits of the public would be governed by “clock time” as in the past, or whether these habits would be altered somewhat to conform more closely to “sun time.” The results of the first week indicate that the actions and habits of the public are quite rigidly governed by “clock time” as heretofore, and this is quite natural when it is considered that we pay little attention to the ordinary seasonal variation of time of sunrise or sunset in determining our time of rising, eating or going to bed. The artificial setting of the clock ahead one hour results, on the first of April, in exactly the same evening conditions as normally exist on June 11th, while the morning conditions are artificially shifted back to those normally existing on February 19th; that is, on April 1st the sun rises an hour earlier than on February 19th and sets an hour earlier than on June 11th.

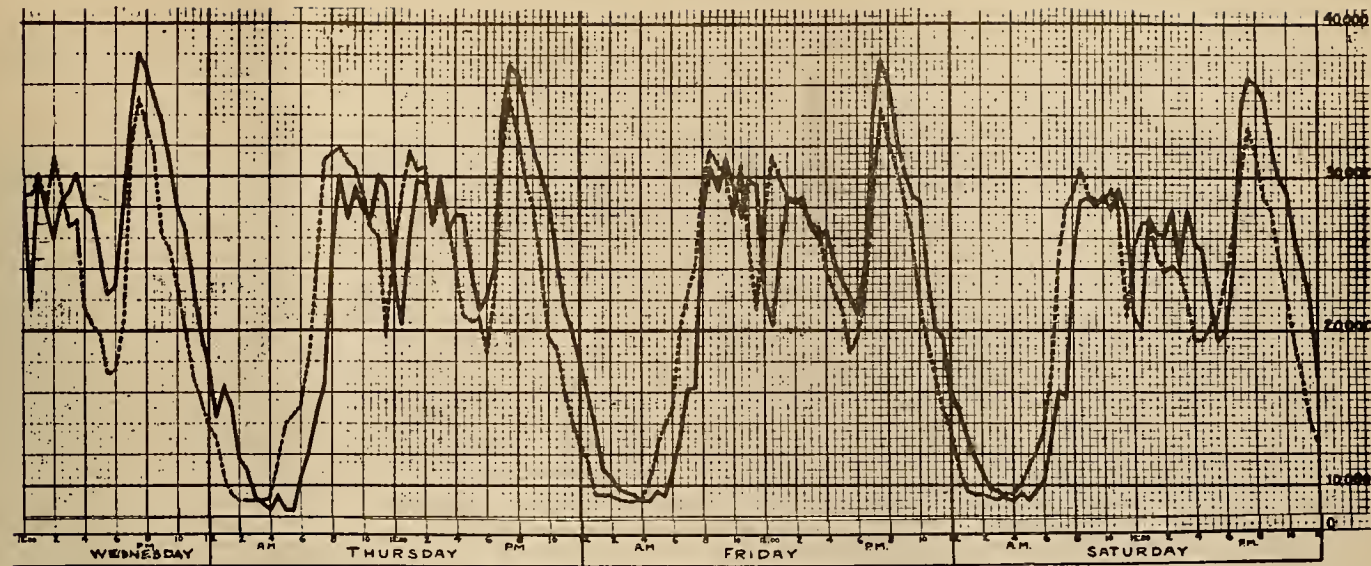
During the first week of the Daylight Saving period load curves of the Pacific Gas & Electric Company were worked out from day to day and compared with corresponding days in the previous week; that is,

the last week under the old time. The accompanying charts shows the result of such a comparison of the load curves for San Francisco for the week March 24th to 30th and the week March 31st to April 6th, the latter week being the first week under the Daylight Saving plan and indicated by the dotted line on the chart.

A study of the load curves presented on the chart indicates several very important changes that the Daylight Saving plan has made. Some of the most important may be briefly pointed out and explained. The first important change that we notice is that the peak load has been very materially reduced. This is probably not due so much to the reduction in the lighting load at the time of the peak (as it will be noticed that the peaks every day in both weeks came almost exactly at the same true time) as it is to the fact that there is less power load on at the time of the lighting peak under the Daylight Saving plan than heretofore.

This effect of reducing the evening peak, if the plan were made effective throughout the year, would for most electric utilities make available for additional load plant capacity equal to the reduction in peak. As it is now, however, with the plan effective for only seven months, this benefit will not be realized.

Another very important and perhaps the most important result of the Daylight Saving plan is the reduction in kw. hr. output, as it will be noted that the lighting peak is very much narrower than heretofore. The difference in time of the “up side” of the peak is in part due to normal lengthening of the days as the season advances and in part to daily weather conditions. The advance in time, however, of the shutting



CHANGE IN CENTRAL STATION LOAD

Note that the time as shown in this chart is true time. The effect of clear or cloudy weather is evident with a study of the curves.

off of the lighting load, indicated by the dotted line being very materially ahead of the solid line practically every day of the week, is due largely to the reduction in the use of electric lighting during the evening hours. In other words, the lighting load is going off at approximately the same time by the clock as heretofore, so that artificial lighting is being used for about one hour less each evening.

To compare the two load curves in detail the daily weather conditions must be considered, and the following table gives a general statement of the weather conditions in San Francisco and vicinity, taken at 5 p. m., true time, for the two weeks period shown on the chart:

	Week of March 24-30, 1918	Week of March 31-April 6, 1918
Sunday	Cloudy	Clear
Monday	Cloudy	Clear
Tuesday	Rain	Clear
Wednesday	Clear	Clear
Thursday	Clear	Part Cloudy
Friday	Clear	Part Cloudy
Saturday	Clear	Cloudy

The variation in weather conditions is shown very clearly by comparing the chart for Thursday, Friday and Saturday. It will be noticed in the above table that in the first week, shown by the solid line, all three of these days were clear, whereas during the second week all three days were cloudy or partly cloudy, the result being to advance the time when artificial lighting is required so as to coincide or in some cases to be ahead of the time when the lighting load came on in the previous week, more than compensating for the normal lengthening of the day.

Estimates indicate that the reduction in the output of the Pacific Gas & Electric Company's plants, due to the Daylight Saving plan, in 1918, will amount to approximately 7,700,000 kw. hrs. with a reduction in revenue of approximately \$350,000. The saving in fuel expense is difficult to determine, due to the use of both hydro-electric and steam plants, but is estimated at approximately \$10,000.

HIGH VOLTAGE TRANSMISSION LINE HAS
• MILE SPAN

In a recent issue of the Canadian Engineer, Romeo Morrisette describes a record breaking stretch of wire. For some years past the Shawinigan Water & Power Company has transmitted power across the St. Lawrence River near Three Rivers by means of a submarine cable, in order to supply its stations on the south shore, viz., Victoriaville, Broughton, Thetford Mines, Black Lake, Windsor Mills, etc.

The increasing amounts of power required on the south shore for mining and industrial purposes made it necessary for the company to design an overhead high tension transmission line to supplement the existing submarine cable. The company has transformer stations on each side of the river about one and a quarter miles upstream from Three Rivers, P. Q., and at this point the river is over a mile wide.

The towers weigh approximately 200 tons each and are built on concrete piers. Each pier is built approximately 500 feet from shore, and the distance between the piers is 5,000 feet, so that the conductors have a clear span of that length. This is the longest known span of its kind.

The construction of the steel towers was started in May, 1917, as soon as the freshets were over, and the northern tower is now completed. The towers are 350 feet high, which is approximately the same height as the main posts of the Quebec Bridge, this great height being necessary in order to get the desired clearance above water level.

Four concrete piers, sunk in caissons, form the footings for each tower. These piers are cylindrical, 11 feet in diameter and 65 feet deep, 40 feet of which is below river bottom. Above the water level the piers are tied together by concrete struts, forming a square 60 feet by 60 feet.

Active work will begin at an early date on the construction of the southern tower, and it is planned to complete the whole work during the coming summer.

ADVANCES IN MULTIPLE ARCH DAM CONSTRUCTION

BY L. R. JORGENSEN

(Insurance against dry seasons in hydro-electric development is dependent on adequate water storage. Types of dams and their relative advantages and possibilities are therefore of considerable interest from an electrical as well as an engineering standpoint. The great advantages which the multiple arch dam bears over earth construction is in the possibility which exists of calculating stresses and strengths with accuracy beforehand. Some of the practical and mathematical considerations involved in this calculation are here presented by an engineer who has had much experience in multiple arch design.—The Editor.)

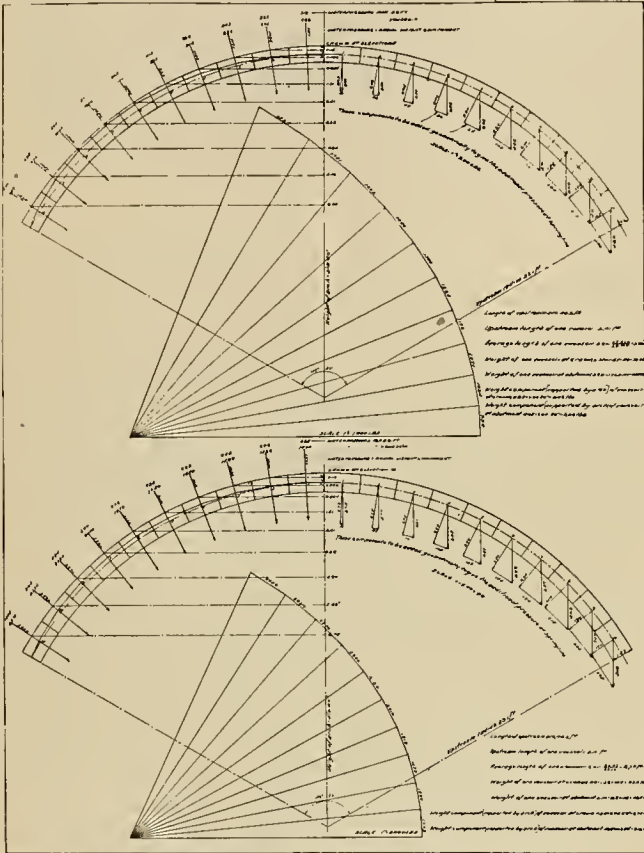
Due to the inclination of the arch, the water pressure is not uniformly distributed between the crown and the abutments on any imaginary arch slice perpendicular to the slope. The crown is located at a

higher elevation, and therefore sustains less water pressure than corresponding points at the abutments.

For the case under consideration, where the length of the upstream radius is 23.1 ft., the subtended angle 120° and the inclination of the arch 50° with a horizontal plane, 40° with a vertical plane, a point at the crown will always be

$$\frac{Ru}{2} \times \sin 40^\circ = 11.55 \times 0.64379 = 7.394$$

feet above a corresponding point at the springing line. Towards the crest this difference in elevation makes a large difference in the distribution of the load on the face of the arch, and therefore also in the location of



ARCH STRESS DIAGRAMS—FIG. 1 AND 2

Span 40 ft., face slope 50°, subtended angle 120°.

Data on upper figure—Fig. 1:

Length of upstream arc—48.2 ft.
Upstream length of one voussoir—2.41 ft.
Average length of one voussoir—

$$2.41 \times \frac{22.538}{23.100} = 2.351$$

Weight of one voussoir at crown—
 $2.351 \times 1.125 \times 145 = 383$ lbs.

Weight of one voussoir at abutment—
 $2.351 \times 1.305 \times 145 = 445$ lbs.

Weight component (supported by arch) of voussoir at crown—
 $383 \times \cos 50^\circ = 246$ lbs.

Weight component (supported by arch) of voussoir at abutment—
 $445 \times \cos 50^\circ = 286$ lbs.

Data on lower figure—Fig. 2:

Length of upstream arc—48.2 ft.
Upstream length of one voussoir—2.41 ft.
Average length of one voussoir—

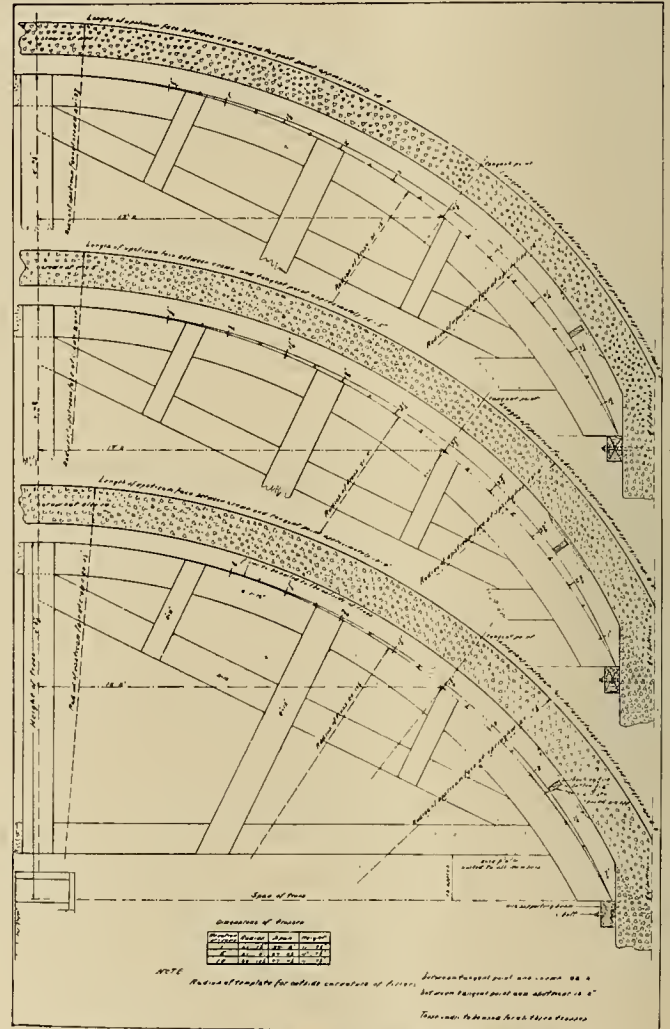
$$2.41 \times \frac{22.43}{23.10} = 2.34$$

Weight of one voussoir at crown—
 $2.34 \times 1.25 \times 145 = 424$ lbs.

Weight of one voussoir at abutment—
 $2.34 \times 1.43 \times 145 = 485$ lbs.

Weight component (supported by arch) of voussoir at crown—
 $424 \times \cos 50^\circ = 273$ lbs.

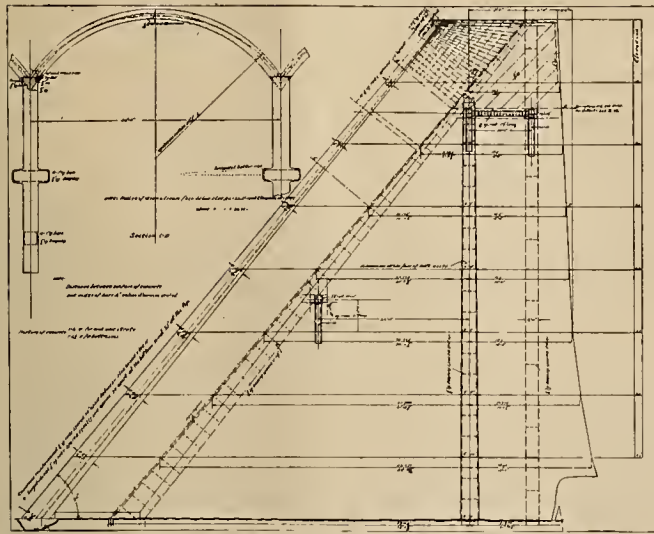
Weight component (supported by arch) of voussoir at abutment—
 $485 \times \cos 50^\circ = 312$ lbs.



UPPER ARCH TRUSSES WITH FILLERS—FIG. 3

the line of pressure in the arch ring. Take, for instance, an arch slice 1 foot wide with the middle of the crown at elevation 5, and with the middle of this slice at the springing line at elevation $5 + 7.394 =$ elevation 12.394. With reservoir full to the crest, the water-load at the middle point of the crown would correspond

to $5 \times 62.5 = 312.5$ pounds per sq. ft., whereas the water pressure at the corresponding point at the springing line would correspond to $12.394 \times 62.5 =$



DETAIL OF MULTIPLE ARCH DAM FOR GEM LAKE—FIG. 4

774.6 pounds, or nearly 2.5 times more than at the crown.

At lower elevations this large difference (2.5 times) is fast disappearing and becomes unimportant with crown elevations below elevation 15. In the upper portion of the dam the radial component of the arch weight borne directly by the arch itself tends towards neutralizing the large difference in water pressure between the crown and the corresponding abutment points, as this weight component has its largest value at the crown and its smallest value at the abutments. This can most clearly be shown graphically, and in Fig. 1 and Fig. 2, two arch slices are drawn, assumed to be one foot wide. One (Fig. 1) with the crown at elevation 5 (the middle of the crown at elevation 5, and then six inches on either side), and the other (Fig. 2) with its crown at elevation 10. The arch is divided up into 20 voussoirs and the forces acting on these voussoirs are calculated. These forces, while not uniformly distributed, are of course symmetrical on both halves of the arch with respect to the centerline between two buttresses.

On the right half of the diagrams are shown the weights of the different voussoirs dissolved into their components. The weight of a voussoir is partly transmitted to the base through the lower portion of the arch, and partly supported by the arch. The last component is equal to the total weight of the voussoir $\times \cos 50^\circ$, and is set off vertically in the diagram, acting through the center of gravity of each voussoir. This vertical load is dissolved in one radial component and one perpendicular thereto. The radial component can now be directly* added to the water load on the same voussoir, which is of course also radial. All the last named (perpendicular) components added together geometrically give the increased axial stress towards the abutments.

On the left half of the diagrams, the total radial forces acting on the different voussoirs are indicated.

*For greater accuracy this force should be multiplied by the ratio $\frac{\text{length of mean radius}}{\text{length of upstream radius}}$. It has been neglected in the present case as this ratio is very close to unity.

A polygon of forces is drawn, and by means of this polygon the line of pressure of the arch can be determined by drawing lines parallel to the proper rays in the polygon of force. It is plainly seen that the line of pressure lies decidedly outside the centerline of the arch, especially is this true of the arch with its crown at elevation 5 (Fig. 1).

By means of these diagrams the correct shape of the wooden arch trusses supporting the formwork for these upper elevations can be ascertained. The outside members of these trusses are made elliptical above elevation 15, as shown in detail on Fig. 3 in such a way as to bring about coincidence between the line of pressure and the center line of the arch. At elevation 15 the center line of the arch and the line of pressure do not exactly coincide, but they are close enough together to allow the circular shape of the arch to be used with entire safety. Below elevation 15 the arch is made circular in a plane perpendicular to its sloping axis, and above elevation 15 it is made elliptical in accordance with the diagrams Fig. 1 and Fig. 2, or a slight modification thereof, depending upon how far below the crest the maximum water level is to be.

Three centered arch trusses could be used of such a shape, as to make the arch circular in a horizontal plane all the way. They are, however, somewhat more complicated to make than the circular ones and it is therefore believed that the circular trusses as described above set perpendicular to the upstream face slope give the most practical formwork.

Stresses Due to Temperature Changes

As dams are generally built during the summer season, it is only logical to assume that after their completion the individual arches are under tensile stress most of the time when the reservoir is empty, and decidedly so if it is empty during the cold season. The reinforcement in the arch has therefore been placed with the sole purpose of taking up these tensile stresses, which reach their maximum value near the downstream face at the crown, and near the upstream face at the abutments, under the above stated conditions. From Fig. 4a it will be seen that the reinforcing steel is located at a distance equal to one-fourth the total arch depth from the respective faces subject to tensile stresses at the crown and at the abutments. The amount of steel put in the arch (see Fig. 4 and Fig. 4a) is perhaps not entirely sufficient to take care of the maximum condition of temperature drop, but it is believed that if tension cracks do develop, the presence of the reinforcement will cause these to be minute and well distributed, and that when the structure becomes loaded the cracks will close tight. It was not deemed advisable to put more steel in the arches than shown, for the reason that it is of comparatively little use when the reservoir is full. It was also kept in mind that a large change in temperature is not liable to occur suddenly, but a time element of perhaps weeks or months is generally interposed between the occurrence of maximum and minimum temperature in a dam body. This time factor can to some extent be depended upon to prevent or minimize temperature cracks. It gives the modulus of elasticity time to adjust itself to the new condition (colder or warmer concrete).

A PRIMER OF INDUCTIVE INTERFERENCE

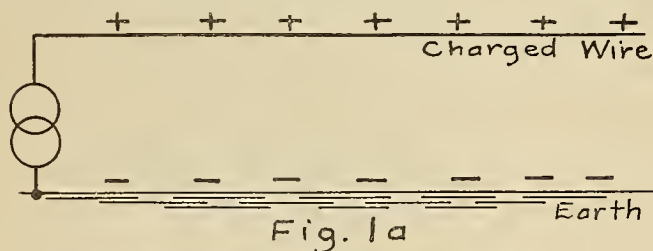
BY D. I. CONE

(Inductive interference, although one of the most important of electrical problems now before the line systems of the West, is often passed by even by electrical men because of its great technical difficulties. In essence, its principles are simple and familiar, as pointed out in this interesting series of articles by a man who has been prominent in the recent investigation of the subject by a Joint Committee in California.—The Editor.)

Electrostatic, or as it may be conveniently called, "electric" induction, is to be carefully distinguished from magnetic induction, which was discussed in the preceding articles. For electric induction is in direct proportion to the voltages, or differences of potential, existing in the disturbing circuit, while magnetic induction is in direct proportion to the current. Practically the two kinds of induction are always coexistent, though one or the other often so predominates as to mask the other.

When a wire, or any conductor, is connected to a source of electric energy, a certain amount of energy is stored in the surrounding space. A familiar example is that of a transmission line open at its receiving end. A large charging current is required merely to raise the voltage of the line to normal value. In this case the energy is stored by a kind of strain in the space about the wires. When the strain is made too great by producing excessive potential differences, breakdown occurs by arcing through the air or puncture of insulators. Another example is the "capacity kick" often observed in making insulation measurement on open wire lines of considerable length, at the moment of connecting to the source of energy. As the wire becomes charged its voltage builds up, less current enters, and the energy input thereafter corresponds to the loss of energy through the insulation resistance.

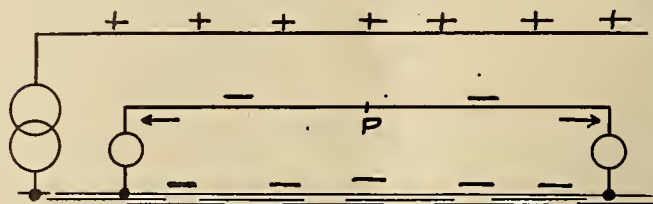
The effect of charging a wire with electricity, on a neighboring circuit, may be looked at in various ways. Suppose a wire positively charged with electricity, represented by + marks in Fig. 1a. The source



The effect of a charged wire on earth charges

of energy being connected to the earth, the corresponding negative charges are distributed over the surface of the earth. If a neighboring wire is connected to earth part of the negative charges enter it, as shown in Fig. 1b. As the electric current consists of the motion of these charges, a current is set up in the second wire in the process of charging the first. When the potential difference applied to the first wire is alternating, the amount of charge on it changes continually in amount and sign (positive or negative) and corresponding changes occur in the induced charges on the earth and the second wire. Thus there is a continual flow of electricity in and out of the second wire, through its terminals or any other connections it may

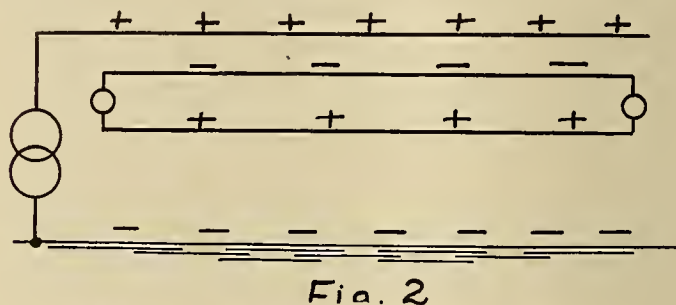
have to earth. This current exists even when only one point of the second wire is grounded. If there are two grounded points the charge induced on the wire between them divides and part flows out through each, when the inducing charge on the disturbing wire is reduced. This is illustrated by the arrows in Fig. 1b.



The effect of a charged wire on a grounded circuit

The disturbed wire could be opened at P without altering the phenomena.

If the disturbed wire in Fig. 1b be disconnected from earth it cannot receive any charge. However, it assumes the potential of the part of the space in which it is, and if it is throughout its length uniformly exposed to the disturbing wire there is no tendency to set up a current along it. Equal and opposite charges are induced on its sides near to and away from the disturbing wire. This point can be illustrated in con-



The effect of a charged wire on a non-grounded circuit

sidering the two-wire circuit as shown in Fig. 2, which might represent a metallic telephone circuit, without connection to earth, near a power circuit wire. At an instant when the power wire has a positive charge, besides the negative charge induced on the earth, there is negative charge on the telephone wire nearest the power wire and positive charge on the other telephone wire. When the charge on the disturbing wire disappears these positive and negative charges unite. In doing so they set up currents in the loop and hence through telephone receivers or other apparatus connected in the circuit.

Electric induction can also be described in terms of a dielectric flux quite analogous to the magnetic flux. In any event, we have the space surrounding the disturbing conductor stored with energy proportional to its voltage, and this energy may in part be transferred into nearby circuits. In the discussion, only one disturbing conductor has been considered. Where there are two or more, and when there are several disturbed circuits, it is necessary to take into account the effect of each one on all the others. As examples, the effect of one wire of a three-phase power circuit is modified by the presence of the other wires; and the disturbing effect of a given exposure is less, on each of a group of circuits, than on a single one. As it is commonly spoken of, they tend to shield each other.

WOMEN IN THE INDUSTRY

(In the coming Pacific Coast Section, N.E.L.A., convention, there is to be one session devoted to women's war service. Red Cross work and service as it applies to women in the home will of course be included—but the major service of women in the war is in the steady maintenance of the nation's work as men drop their tools to go to the front. The record of women is today already a broad one—as is to be noted in these reports of women's service from all branches.—The Editor.)

THE ATTRIBUTES OF A 100% SECRETARY

In the woman's issue of the Western Electric News, the attributes of an ideal secretary are told by one who evidently has thoroughly analyzed the work.

A great many young women start out in the business world in the hope of becoming secretaries. Many reach the goal, but many fail. To begin with, a thorough knowledge of shorthand and typewriting is essential, supplemented by a grammar, and preferably a high school education. The less education you begin with, the more you will have to acquire after taking a position, for without it you can not expect to get very far in these days of competition.

There is all the difference in the world between a stenographic and a secretarial position. In the former, the employer takes the responsibility for seeing that letters are correctly written and other matters attended to, while the real secretary's duty is to relieve the employer of much of this work. A secretary's work is necessarily executive and creative in a degree; there must be independent thought, and at the same time the ability to execute the thoughts of another.

In addition to being a capable stenographer, a secretary will find the following qualities essential, and the more responsible the position the more they are needed:

Interest in the Work.—Your interest will indicate improvements to you that an uninterested person will overlook.

Initiative.—Do the right thing at the right time without being told.

Loyalty.—A business man must naturally trust his secretary with certain of his thoughts and ideas, and this should be a sacred trust. While you work for a man you owe him your unflinching loyalty.

Judgment.—When left to decide matters yourself, do not act solely on impulse but give sufficient thought to the consequences. Keep your head.

Concentration.—Focusing one's attention on the work is the only sure way of avoiding errors.

New Ideas.—Don't hesitate to submit your ideas for improvements in the way of handling your work. Sometimes they will not seem to be as worth while to others as they do to you, but your mind is developing with each and in time you will hit upon one that will compensate for your disappointments. New ideas are always in demand.

Personality.—Your ability to make a good impression on others will mean a great deal in a secretarial position. A pleasing manner is absolutely necessary in dealing with people, and the more likeable you are to people, the smoother will be your path.

Manners.—One fatal mistake of a secretary is to assume an important air toward subordinates and others as she advances in position. The manner in which people are met by the secretary reflects credit on the employer. The efficient secretary should meet such people courteously, as she knows her employer would do, and in dealing with subordinates she will gain their respect and co-operation by putting herself in their places, and acting accordingly.

Good Appearance.—It is essential that a secretary keep

herself healthy, clean and neat. Proper dress for business means using common sense in discriminating between undesirable extremes. You do not find frills and furbelows in important offices.

Patience.—The more patience you have the easier the work will be, for sometimes infinite patience is required when everyone about you is working under a heavy strain.

Self-reliance.—Learn to rely on yourself and to decide petty matters without annoying your employer with them. Have confidence in yourself and others will have confidence in you.

A secretary's progress depends entirely on the amount of her own energy put into the work. The more of yourself put into the work, the greater will be the returns. Your value over that of a stenographer is entirely dependent upon this. The secretary who takes it for granted that her position is secure—that she need not exert herself to become more efficient—will find that someone else has moved on ahead of her. The only way to hold your position is to do your work so well that no one in the organization is capable of filling the position any better than you are filling it.

POSSIBILITIES FOR WOMEN IN ELECTRICAL WORK

A recent publication of the Corn Exchange National Bank of Philadelphia lists the processes in the various industries in which women can do the work of enlisted men, as has been learned through the experience of England in this war.

There is much work in the gas and electricity departments which can suitably be done by women, and in some districts the replacement of men by women began very early. In Sheffield, for instance, women have been employed to read meters since the early days of the war. In all work connected with inspection, maintenance and repair of stoves, meters, lamps, burners and mantles, the introduction of women presents no serious difficulty and they are now employed upon work of this kind in both the gas and electricity services in many districts. In some cases the fitting of gas stoves is also done by women. The collection of accounts, and of money from slot meters is to a great extent in the hands of women, and also the work of show room attendants and of cleaners in power stations and other departments.

In electric power stations, under both tramways and lighting departments, women are being employed as switchboard attendants. In Glasgow women who have been specially trained have been very successful in this work, and some have even progressed so far as to be in independent control of some of the sub-stations. Women switchboard attendants are also employed by the Kilmarnock lighting department, and by some English power companies. The London County Council tramways department are employing women as magnet and coil winders.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The scarcity or abundance of supply, the character of the demand, the cost of the development, and alternative uses for which the water is needed, as well as other more or less tangible factors, enter into the determination of the water right value. Precedent and court decisions are also determining factors, although not necessarily decisive. A comprehensive consideration of these elements is here presented by an engineer who is an authority on valuation matters.—The Editor.)

MARKET VALUE OF WATER RIGHTS— GENERAL CONSIDERATIONS

Water is essential to life. Where man makes his home and engages in the varied occupations and industries that provide for his necessities and comforts, he must have an adequate supply of water of suitable quality. Sometimes the water is close at hand and abundant; sometimes its source is remote. The close proximity of its source, though a factor, is no longer essential in determining the location of human habitations and activities. Great ingenuity is exercised in conserving water and in transporting it to the points where, due to various other considerations as well as that of a water supply, the establishment of industries, of business and commercial centers, and of residences has become desirable. Water is required for many purposes other than those which are directly connected with the sustaining of life. It is used in many ways in practically every industry, particularly as a means of developing energy not only in the form of steam but because it has weight and when dropped from the clouds upon the land it flows from higher to lower levels and this flow, under proper direction, is a source of power. It adds beauty to the landscape and when gathered in streams and lakes in large enough quantity becomes an aid to transportation. It ministers to the wants and pleasures of man in various ways. Where abundant it has at its source, little or no market value. When, however, the demand increases in relation to the supply, and the source of supply or access to this source has come under private ownership, and particularly when the place where the water is required is at a distance from the water's source, the water will have acquired a market value at the place of delivery. Some sacrifice must be made by the individual who desires to use it in return for the sacrifice which some one else has made to bring it within convenient reach. The water as supplied in a container or the service rendered in transporting it to the place of use must be paid for.

Where the productiveness of the soil can be increased by artificially applying water to the field, if, at the same time, the demand for water to be thus used exceeds the supply, the farmer who has the right to use the water has an advantage over the other farmer who is unable to secure water for irrigation. The increased productiveness of the soil or rather the increased net return of the irrigated farm when compared with the net return of the unirrigated land, under due consideration of all factors influencing the market value of land, may help to determine the market value of the right to use water for irrigation.

That the right to water for irrigation, when the water delivered at the field is considered, has a market

value goes without saying. It follows that, depending upon the amount of land in relation to the amount of available water and upon the cost of delivering the water from various sources, at the time and at the places where it is wanted, the respective water rights at the sources of the supply, according to relative cost of development, including transportation to place of use, must also have more or less market value. This market value responds to various factors, notably those affecting supply and demand and in this respect is analogous to that of ordinary commodities. Here, as in the case of the ordinary commodity, the cost of getting the water into a condition in which it can be put to a useful purpose will ordinarily be the natural starting point when a determination of what the consumer should and will pay for it is to be made. Even when there are no competitive sources, society would not long consent to a wide departure from this fundamental requirement. It is not to be inferred from this statement that there is or can be an exact determination of market price or of value, purely from cost, because there are many other factors besides cost, which influence exchange price and market value. In the first place the margin above cost, to which an owner is fairly entitled, is variable within wide limits. In the next place the cost itself is variable to an exceptional extent. The use of water for irrigation results in the production of crops which can be marketed at prices not subject to regulation except by the law of supply and demand. Irrigation modifies the character and increases the amount of the crop. It increases the gross yield of the field and it may increase the farmer's profit. An increment of value may thus be added to the land for which irrigation water is obtainable. This increment of value is not uniform, depending as it does upon many factors. Even in the same locality under the same conditions of soil and climate and accessibility to market, there may be a wide range in the value added to the land by a water right, because this right itself may range from a full supply producing maximum crops to an unreliable intermittent supply which is barely enough to justify its application to the land. The value which the availability of the water adds to the land, under due consideration of all attendant circumstances, can be used as an aid in determining the market value of the water right.

These statements relating to the market value of water rights applying more specifically to the cases in which water is used for irrigation, apply in the main, too, where water is used for domestic purposes. In all cases in which the market value is in question consideration must also be given, regardless of the character of the demand, to such factors as the suitability

of the water for the proposed use and the time when it will come into use and in some cases, too, the time period during which the use of the water will continue. Water being essential for domestic use, it must be had in fair quantity and of good quality, wherever a community is established, regardless of the cost of securing it. A water right which is destined to be continued in use for a period of time without limit will have a larger market value than the same water right would have if, due to future availability of water of superior quality or other cause, a prospective abandonment of use would have to be assumed.

Prime factors in determining market value of water rights will, therefore, be the scarcity or abundance of the supply, the character of the demand, the relative cost of the development, the alternative uses to which water might be put, the value of water rights for other purposes and in other localities which by reason of the scarcity or abundance of water in relation to the demand are comparable with the water right in question. The cost of eliminating adverse rights and the cost of adding more water from other sources may also influence the value. The question, too, whether the water is already in use, whether it will all be immediately required, or whether the demand therefor, in whole or in part is prospective, will influence the market value.

These and other factors deserve consideration when the market value of a particular water right is to be determined, but only to the extent that they bear upon the public's estimate of value. None of them can be made a standard of value. The market value of a water right reflects the judgment of the public based on all these and any other circumstances which immediately or remotely have a bearing on the advantages or disadvantages of utilizing the water or which in any way tend to crystallize the judgment of the public.

Stream flow is variable. The quantity of water flowing in the stream is not uniform at all seasons of the year, nor is the amount the same at the same season in different years. Consequently the privilege to take water from the stream may have greater or less value according to the relation of the amount of water in question to the quantity of water appearing in the stream from time to time and its relation to other rights in the matter of priority. The reliability of service is, therefore, too, an attribute of more or less value.

Where water is at all times abundant and can be had for the taking, the water right, as already stated, has little or no value. But where the immediate or proximate beneficial use to which the water can be put exceeds the supply, part or all of the time, the privilege to take the water acquires value.

In the case of a water supply which will in the near future become inadequate by reason of insufficiency, the market value of the water right may be materially affected by the cost of acquiring additional water. An originally low market value of the water right may, by such comparison, when the demand for the utilization of more remote and more expensive sources is in question, be enhanced or if the addition can be made at a low cost it may be decreased.

The availability of alternative sources of supply,

then, is also a factor that may have to be taken into account when the market value of any particular water right is to be determined. That there is a clear distinction between the water right here under discussion, being the privilege to take water at its source, and the right to a definite or proportional part of the developed water in a ditch or canal, has already been pointed out.

When a person who has put an available water supply to a continuing use or proposes to put it to such use at an early day, finds himself so circumstanced that he can not be deprived of the water or of its use, against his will, except by condemnation, such person has acquired a water right.

The water right as thus defined may apply to water required for domestic use; it may be a riparian right running with the land, subject to more or less restriction upon the amount that may be delivered by the riparian owner for such uses as irrigation, which reduce the flow of the stream; it may be a right to use the water for the generation of power, or to use it for industrial purposes, or for irrigation; or it may be a right to supply water to consumers at population centers, for all the varied uses to which water can be put.

Where, as in California, the doctrine of riparian rights is recognized, there can be no appropriation of water from a stream for uses that will reduce or otherwise modify the flow without fair compensation to the riparian owner who by such appropriation would be deprived of his riparian rights, or who would find them modified by structures on the stream or by the diversion. When the demand of society requires that water from a stream be applied to uses superior to those vested in the riparian land, suitable compensation must in some way and by some one be made to the riparian owner. The appropriator of the water, to the extent that the circumstances require, must extinguish the riparian rights.

Ordinarily this will involve the making of compensation for the relinquishment of such rights to the extent that they interfere with the appropriation in question. The appropriator may thus find himself compelled to make an investment of capital to secure the privilege to divert the water of the stream from its natural course.

The case may now be considered of two water rights in separate ownership from two streams similar in location and amount of flow, equally available, whose combined yield of water is in demand for some useful purpose. On one of these, perhaps, by reason of topography or otherwise, there is little or no outlay required to extinguish and eliminate riparian and other rights, while on the other the cost of extinguishing such rights is material. The owner of the right to divert water on the former of these streams will claim that his water right has the same market value as the water right on the latter. Furthermore, the cost of acquisition on the latter will naturally represent a lower limit of the value of the water right on that and, therefore, on both streams, it being, of course, assumed that all transactions relating to the extinguishing of the riparian rights on the latter were legitimate and proper.

The market value of a water right, as in the case of the market value of other property, is the public's estimate of the effect of all pertinent circumstances upon the desirability of the water right as property that can be exchanged for other property. But transactions in water rights are not frequent and parallel circumstances will be rare. Moreover, the circumstances which affect the amount which a purchaser actually pays because he can afford to pay, and because the water is of especial value to him, are extremely variable and no doubt frequently determine the amount involved in the transaction, so that any transaction considered by itself, perhaps without its being apparent, may lose value as an index to the public's judgment. It is not a simple nor generally satisfactory matter to use water right sales of which information may be available, in the determination of the value of other water rights unless the water rights all belong in the same class. The best that can be done is to give consideration to the circumstances that would guide a prudent purchaser and a willing seller in determining a fair price of exchange. An exchange price thus determined is then to be accepted as the market value. When the value of a water right which is in demand for a domestic supply is in question the fact must be regarded, too, that the nature of the demand is different from that of the demand for other uses of water. In all other cases the water, even when there is no other to be had, will not be used if it does not lead to an increase of profit on the part of the consumer, while in the case of water required for domestic use the demand is imperative.

The judicial determination of value is another factor that deserves consideration when the market value of a water right is to be ascertained. Court findings, while not free from human fallibility, must be recognized as influencing public opinion in no small degree, when such matters as the value of intangible elements of property or of property which has special adaptability to a particular use are in question. The findings of the court come with much force, because of the opportunity supposed to be extended to the litigants to bring to the attention of the court every fact that has any bearing on value, and because the public is prone to accept court findings as fair and unbiased conclusions. This is particularly true when the judgment of the court is expressed on the market value of a property peculiarly adapted to a special use or so circumstanced that market value is not readily ascertainable from supply and demand, as would be the case if records were accessible of frequent transfers of similar property. The court decision acquires weight, in other words, by reason of the difficulty which exists of making a fair estimate of market value by ordinary methods. This statement relating to court decisions applies, also, to the findings and valuations of public service commissions.

Other valuations than those made by judicial authorities may also influence the market value of such items of property as water rights. Assessor's valuations for tax purposes, the valuations of experts for rate fixing or for condemnation and the like may be noted in this connection. But when there are one or more court or commission decisions which cover the case in question or which are fairly applicable, these

other valuations can be of but minor influence upon market value.

In illustration of the fact already stated that, as applied to water from any particular source of supply, the demand for domestic and related uses remains imperative so long as there is no adequate alternative, the case of San Francisco may be cited. By reason of this city's geographic position and the climate of the Pacific Coast, its relation to nearby sources is noteworthy. San Francisco is located at the northern extremity of the peninsula which lies between the south arm of San Francisco Bay and the ocean. On three sides of the city there is water, on one only, to the south, is there land. This is the main body of the peninsula, which, from a width of about six miles at San Francisco, in a distance of some thirty miles gradually widens to a width of about twenty miles at its base. The streams on this peninsula naturally take their courses from the backbone thereof, either to the east into the bay or to the west into the ocean. They are all, therefore, short with small drainage areas. There is no large stream of perennial flow near at hand. Not only is the nearby territory that can be used as a productive watershed thus unusually limited, but the meteorological conditions that prevail on the Pacific Coast, and more especially in California, are not conducive to the maintenance of perennial flow in the small streams. In the summer and fall months, May to October, inclusive, the rainfall is very light, being practically negligible in so far as production of run-off is concerned. The rain in the winter and spring usually falls in a series of storms, following each other at intervals of one to three weeks. These storms vary in intensity and duration. Sometimes one will not have passed before another begins. They cause the small streams of the peninsula to flash up suddenly to freshet conditions, at which they are maintained hardly longer than the storm continues. The stream flow between storms is moderate, representing, as it does, the surplus water which during the storms has penetrated pervious soils or has otherwise reached pervious strata, and gets to the stream by slower process than by direct flow over the surface of the ground. The total rainfall which produces the run-off is not heavy. It ranges, as determined from the records of a long series of years, from about 23 inches per annum at San Francisco to about 45 inches per annum in the vicinity of Pilaicitos reservoir. It is less along the ocean shore and along the bay shore than at or near the summits of the mountain ranges which form the backbone of the peninsula. From year to year the variation in the amount of rain is large. In a season of maximum rain about twice the normal may be expected; in the season of minimum rain the amount may drop to less than 40 per cent of the normal. One half of the seasons of any long period are expected to show amounts of rain not varying more than 20 per cent from the normal. There may be ten seasons or even more in succession in which there is no season with a large excess above the normal rain. Under such conditions there is no water supply to be hoped for on the peninsula, for a large city such as San Francisco, from direct flow from nearby living streams. The demand is far in excess of the normal low water yield of nearby springs and streams. Not only is this

the case, but there have been seasons in which the total seasonal run-off on the peninsula has been almost negligible. Furthermore, two or more seasons with very unfavorable run-off conditions may succeed each other. These unfavorable run-off conditions may result either from very light seasonal rainfall or from the distribution of the rainfall to a number of storms each of light or only moderate intensity and with a drying interval between the successive storms.

These topographic and climatic conditions made it necessary as the city grew and the demand for water increased, to conserve, where practicable, the freshet flow of the stream, by storage, and to provide sufficient storage, as near to San Francisco as possible, to safeguard the supply. Before the Alameda Creek supply from the east side of the bay was added to that of the peninsula sources, the rule was to have on the peninsula storage capacity 900 to 1000 times as great as the average daily demand. When, notwithstanding the storage facilities that had been provided on the peninsula, it became apparent thirty years ago that more water must be obtained, the next most available source, Alameda Creek, was selected. The extension of the system across the bay was timely; the demand for an extension was an imperative demand. But as a result of this addition to the sources of water, the requirement that there should be storage capacity on the peninsula for a 900 days' supply became somewhat less urgent, because the comparatively large yield from the constant flow sources of Alameda Creek made it possible to restrict the use from storage and to hold back a larger proportional part of the reservoir water for emergency use than had heretofore been possible. But, as compared with the Alameda sources, the peninsula reservoirs have the advantage of proximity to the place of use and of elevation. Their water requires less pumping. The growing communities on both sides of the bay are constantly requiring more water. The demand for the utilization of the peninsula reservoirs as sources of water for domestic use is a continuing demand.

When in 1879, the late Colonel G. H. Mendell reported to San Francisco on the available sources of water, he said in his closing statement:

It must be clear that the position and circumstances of San Francisco, as compared with other American cities, are unfavorable for a cheap supply. It only remains for the people of the city to use their supply judiciously. While there will always be enough for useful purposes, there is none for waste. The supply will doubtless at some future time be supplemented by the use of sea water for the purposes for which it is applicable.

This may be taken to indicate the view then held by those who were best informed on the local water situation.

WOMEN CONDUCTORS NOT ALLOWED

The Washington State Public Service Commission has decided against the employment of women as conductors on street cars of the Puget Sound Traction, Light & Power Company. The commission ruled, in effect, that the health of the women would be endangered by such employment. The traction company had been hard put for men to handle the traffic in the congested districts, having lost so many men to the service of the country and many others to the shipyards,

THE WAY THEY DO IT IN PASADENA

A small concrete building, surmounted by a pergola, artistically vined and kept in A-1 condition, houses the South Pasadena Sewage Disposal Plant.

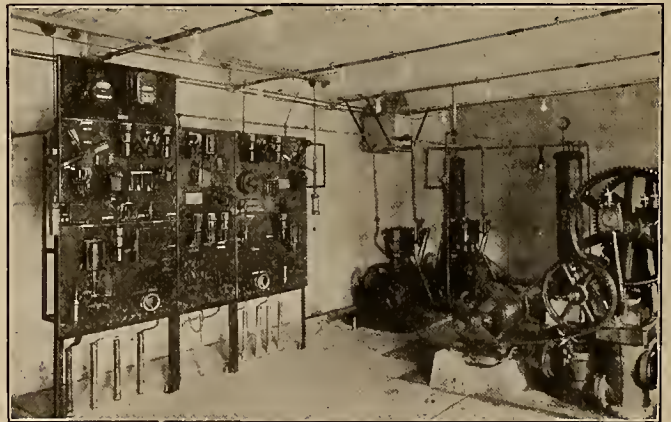
Not only is the exterior appearance most attractive, but the pumping system and switchboards within have several features of interest.

The rate of disposal of sewage is of necessity subject to wide variations and it is natural, therefore, to provide for automatic means of starting the pumps when the level in the settling chambers becomes too high, and to stop the pumps when the level is reduced to a safe condition. But a pump which is large enough to cope with the maximum



Entrance to power room

conditions would be unsatisfactory, in that it would have to be started and stopped at undesirably frequent intervals, and in case trouble developed with this single pumping unit, there would be serious criticism of the lack of foresight of the health authorities, to say the least.



SEWAGE DISPOSAL PLANT PUMPING EQUIPMENT

Automatic motor control and motor equipment is in duplicate—for operation on A. C. or D. C. service.

It, therefore, becomes desirable to provide at least two pumping units, with control devices so arranged that as the level of the water in the settling chamber rises, unit No. 1 will be started at a certain height, and in case the capacity of this pump is not sufficient to keep the level from increasing, then the second pump is automatically started, giving the combined capacity of the two pumps working simultaneously. The float switches are adjusted so that the pump which started second is the one which stops first. This results in the wear being concentrated almost entirely on the first equipment, and in order to permit equalization of the wear, means are provided to permit the relative interchange of the connections between the two float switches, and the two motors driving the pumps, it merely being necessary for the attendant at periodic intervals to shift this switch from one position to the other.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Standardized rules for boiler tests when oil is used as a fuel have long been a crying need in the West, and indeed in many other sections of the nation where this type of fuel is becoming of more and more prominence in these days of national emergency. Here are some suggestions made by the authors at the invitation of the Power Test Committee of the American Society of Mechanical Engineers, and presented in person at the committee's hearing last December. Further comment on this important subject may also be found in the editorial pages of this issue, and in the new book by the authors, entitled "Elements of Fuel Oil and Steam Engineering," which is just off the press and now available to the trade.—The Editor.)

SUMMARY OF SUGGESTIONS FOR FUEL OIL TESTS AND THEIR TABULATION

The rules for conducting boiler performances, as advised by the Power Test Committee of the American Society of Mechanical Engineers, covers in wonderful detail the setting forth of apparatus and tabulation of data for such performances, when coal is employed as a fuel. Only brief mention is, however, made for alterations necessary when crude petroleum is used as a fuel. Since a greater number of engineers would probably be inconvenienced than those actually benefited by attempting to make a set of rules broad enough to cover both performances by coal and by oil as fuels, an appendix should be drawn up to satisfy standardized conditions of test for oil fired boilers. This lack of standardized performance has caused considerable confusion in those communities where oil is used as a fuel.

The most glaring source of confusion is that relating to boiler efficiency. Some engineers maintain that boiler efficiency is the ratio of heat actually transferred from the fuel through the metallic parts of the boiler to the total quantity of heat given out by the fuel. When coal is used as a fuel this definition is perfectly proper, but when oil is the fuel employed confusion is at once introduced, due to the fact that as a rule a certain amount of the steam generated must be utilized to atomize the oil in the furnace. In the last chapter it was shown that the efficiency of an oil fired boiler computed on one assumption in a specific instance is 75.27 per cent, and on another assumption it becomes but 72.37 per cent.

Let us then discuss some of the points wherein additional instructions are desirable to properly conduct boiler tests where oil is used as the fuel for heat production.

Efficiency for Oil Fired Boilers Defined.—Perhaps the most important point is to come to some definite decision relative to an exact manner of arriving at the efficiency of the boiler as above alluded to. In this work we shall consider that the true efficiency of the boiler and furnace is to be found by taking the ratio of the heat represented in the steam after deducting the heat used for atomization purposes to the total quantity of heat given out by the fuel, as set forth in the last chapter. On the other hand to compute the efficiency of the boiler shell as a steam producing agent, we shall take the ratio of the heat of all steam generated in the boiler for a given consumption of fuel to the total heat given out by the fuel. The efficiency of a boiler and furnace is as a rule reduced from

2 to 5 per cent over the boiler efficiency as a steam producing agent, as shown in the previous paragraph.

Upon invitation of the Power Test Committee of the American Society of Mechanical Engineers, the authors of this work have presented proposals to the Society to meet this growing need in standardization.

In these tables the item numbers have been retained as far as possible to correspond with the item numbers in the code of 1915. The principal changes consist in the following: The omission of reference to grates and grate surface and substituting therefor the number of oil burners and dimensions of furnace; the omission of reference to ash, combustible, firing data, etc., but introducing instead items connected with the steam used for atomizing the oil at the burner. The term "net efficiency" is also introduced, by which is meant the efficiency of the boiler after taking into account the steam used in atomization.

In addition to the tabulations submitted, the writers have suggested that the appendix in the Code Rules be amplified so as to include a description of methods for obtaining gravity of oils, flash point, the water content and the viscosity. These determinations could be fully described and included in Appendix No. 14, beginning with paragraph 287 under the heading "Analysis of Liquid Fuels."

TABULATION OF FUEL OIL TEST DATA

Table 1. Data and Results of Evaporative Test.
Adapted from Code of 1915

(1)	Test of.....boiler located at.....
	to determine.....conducted by.....
(2)	Number and kind of boilers.....
(3)	Kind of furnace.....
(a)	Type of burner.....
(b)	Make of burner.....
(c)	Number of burners.....
(4)	Furnace dimensions.....width.....length.....height.....
(a)	Approximate area of air openings in furnace floor.....sq. in.
(b)	Approximate area of air openings around burners.....sq. in.
(c)	Total area of air openings.....sq. in.
(d)	Total area of air openings per rated horsepower.....sq. ft.
(e)	Volume of furnace.....cu. ft.
(f)	Distance from furnace floor to nearest heating surface.....ft.
(5)	Water heating surface.....sq. ft.
(6)	Superheating surface.....sq. ft.
(7)	Total heating surface.....sq. ft.
Date, Duration, Etc.	
(8)	Date.....
(9)	Duration.....hr.
(10)	Kind of fuel oil.....
(a)	Gravity of fuel oil at 60 deg. (specific gravity).....
(b)	Gravity of fuel oil at 60 deg. (Baume scale).....
(c)	Flash point of oil.....deg.
(d)	Viscosity of oil at.....deg.....deg. Engler.
(e)	Method of atomizing oil.....
Average Pressures, Temperatures, Etc.	
(11)	Steam pressure by gage in boiler.....lb. per sq. in.
(a)	Steam pressure at superheater outlet.....lb. per sq. in.
(b)	Steam pressure at oil burners.....lb. per sq. in.
(c)	Oil pressure at burner.....lb. per sq. in.
(d)	Barometric pressure.....ins. of mercury.
(12)	Temperature of steam at superheater outlet.....deg.
(a)	Normal temperature of saturated steam.....deg.
(b)	Temperature of steam at oil burner.....deg.
(c)	Temperature of oil at burner.....deg.
(13)	Temperature of feed water entering boiler.....deg.
(a)	Temperature of feed water entering economizer.....deg.
(b)	Increase of temperature of water due to economizer.....deg.

(14)	Temperature of gases leaving boilers.....deg.	(g)	Water in sample of fuel oil as received.....per cent.
(a)	Temperature of gases leaving economizer.....deg.	(55)	Heat balance, based on fuel oil free from water:
(b)	Decrease of temperature of gases due to economizer.....deg.		Fuel Oil Free From Water
(c)	Temperature of furnace.....deg.		B. t. u. Per Cent.
(15)	Draft between damper and boiler.....ins. of water	(a)	a. Total heat absorbed by boiler..
(a)	Draft in main flue near boilers.....ins.		b. Heat absorbed for atomization
(b)	Draft in main flue between economizer and chimney.....ins.		c. Net heat absorbed for power...
(c)	Draft in furnaces.....ins.	(b)	Loss due to water in fuel oil.....
(d)	Draft in ash pits.....ins.	(c)	Loss due to water from burning H
(16)	State of weather.....	(d)	Loss due to heat carried away by dry gases.....
(a)	Temperature of external air.....deg.	(e)	Loss due to carbon monoxide....
(b)	Temperature of air entering ash pit.....deg.	(f)	a. Loss due to evaporation of steam for atomization.....
(c)	Relative humidity of air entering ash pit.....per cent.		b. Loss due to superheat of steam used for atomization.....
	Quality of Steam		c. Total loss due to atomization...
(17)	Percentage of moisture in steam or number of degrees of superheating.....per cent. or deg.	(g)	Loss due to moisture in entering air.....
(18)	Factor of correction for quality of steam.....	(h)	Stray losses.....
	Total Quantities	(i)	Total calorific value of 1 lb. of fuel oil free from water (item 42a).....100
(19)	Weight of fuel oil as fired ².....lb.		
(20)	Percentage of water in fuel oil as fired.....per cent.		
(21)	Total weight of water free fuel oil consumed.....lb.		
(25)	Total weight of water fed to boiler.....lb.		
(26)	Total water evaporated corrected for quality of steam.....lb.		
(a)	Total weight of steam fed to burner.....lb.		
(b)	Steam fed to burner in per cent. of total water evaporated.....per cent.		
(27)	Factor of evaporation, based on temperature of water entering boilers.....		
(28)	Total equivalent evaporation from and at 212 deg. ³.....lb.		
	Hourly Quantities and Rates		
(29)	Oil free from water consumed per hour.....lb.		
(30)	Oil free from water per hour per burner.....lb.		
(a)	Oil free from water per cu. ft. of furnace volume per hour.....lb.		
(31)	Water evaporated per hour, corrected for quality of steam.....lb.		
(a)	Steam fed to burners per hour.....lb.		
(b)	Equivalent evaporation from and at 212 deg. of steam fed to burner per hour.....lb.		
(32)	Equivalent evaporation per hour from and at 212 deg. ³.....lb.		
(33)	Equivalent evaporation per hour from and at 212 deg. per sq. ft. of water heating surface.....lb.		
	Capacity		
(34)	Equivalent evaporation per hour from and at 212 deg. (same as line 32).....lb.		
(a)	Boiler horsepower developed (line 32 ÷ 34½).....Bl. H. P.		
(35)	Rated capacity per hour, from and at 212 deg.....lb.		
(a)	Rated boiler horsepower.....Bl. H. P.		
(36)	Percentage of rated capacity developed.....per cent.		
	Economy		
(37)	Water fed per lb. of fuel oil as fired (item 25 ÷ item 19).....lb.		
(38)	Water evaporated per lb. of water free fuel oil (item 26 ÷ item 21).....lb.		
(39)	Equivalent evaporation from and at 212 deg. per lb. of fuel oil as fired (item 28 ÷ item 19).....lb.		
(40)	Equivalent evaporation from and at 212 deg. per lb. of water free fuel oil (item 28 ÷ item 21).....lb.		
(a)	Equivalent evaporation from and at 212 deg. of steam fed to burner per lb. of fuel oil free from water (item 26a × item 27 ÷ item 21).....lb.		
(b)	Net equivalent evaporation from and at 212 deg. per lb. of oil free from water (item 40 — item 40a).....lb.		
	Calorific Value		
(42)	Calorific value of 1 lb. of fuel oil as received by calorimeter.....B. t. u.		
(a)	Calorific value of 1 lb. of water free fuel oil.....B. t. u.		
	Efficiency		
(44)	Efficiency of boiler and furnace.		
	$100 \times \frac{\text{Item 40} \times 970.4}{\text{Item 42a}}$.....per cent.		
(a)	Net efficiency of boiler and furnace.		
	$100 \times \frac{\text{Item 40b} \times 970.4}{\text{Item 42a}}$.....per cent.		
	Cost of Evaporation		
(46)	Cost of fuel oil per bbl. of 42 gals. delivered in boiler room.....dollars.		
(47)	Cost of fuel oil required for evaporating 1000 lb. of water under observed conditions.....dollars.		
(48)	Cost of fuel oil required for evaporating 1000 lb. of water from and at 212 deg.....dollars.		
	Smoke Data		
(49)	Percentage of smoke as observed.....per cent.		
(a)	Weight of soot per hour obtained from smoke meter.....		
(51)	Analysis of Dry Gases by Volume.		
(a)	Carbon dioxide (CO ₂).....per cent.		
(b)	Oxygen (O).....per cent.		
(c)	Carbon monoxide (CO).....per cent.		
(d)	Hydrogen and hydrocarbons.....per cent.		
(e)	Nitrogen, by difference (N).....per cent.		
(53)	Ultimate analysis of fuel oil.		
(a)	Carbon (C).....per cent.		
(b)	Hydrogen (H).....per cent.		
(c)	Oxygen (O).....per cent.		
(d)	Nitrogen (N).....per cent.		
(e)	Sulphur (S).....per cent.		
(f)	Ash.....per cent.		
	100 per cent.		

¹These numbers correspond in so far as possible with numbers given in the A. S. M. E. Code of 1915.

²The term "as fired" means actual conditions, including moisture.

³The symbol U. E., meaning Units of Evaporation, may be substituted for the expression "Equivalent Evaporation from and at 212 deg."

Table 2			
Principal Data and Results of Boiler Test			
(1)	Oil Burners.—No.....	Type.....	Make.....
(2)	Total heating surface.....sq. ft.		
(3)	Date.....		
(4)	Duration.....hr.		
(5)	Kind and gravity of fuel oil.....		
(6)	Steam pressure by gage.....lb. per sq. in.		
(7)	Temperature of feed water entering boiler.....deg.		
(8)	Percentage of moisture in steam or number of degrees of superheating.....per cent. or deg.		
(9)	Percentage of water in oil.....per cent.		
(10)	Oil free from water per hour.....lb.		
(11)	Oil free from water per hour per burner.....lb.		
(12)	Equivalent evaporation per hour from and at 212 deg.....lb.		
(13)	Equivalent evaporation per hour from and at 212 deg. per sq. ft. of heating surface.....lb.		
(14)	Rated capacity per hour, from and at 212 deg.....lb.		
(15)	Percentage of rated capacity developed.....per cent.		
(16)	Equivalent evaporation from and at 212 deg. per lb. oil free from water.....lb.		
(a)	Per cent. of total steam used by burner.....per cent.		
(17)	Net equivalent evaporation from and at 212 deg. per lb. of oil free from water (deducting steam used by burner).....lb.		
(18)	Calorific value of 1 lb. of oil as received, by calorimeter.....B. t. u.		
(19)	Calorific value of 1 lb. of oil free from water.....B. t. u.		
(20)	Efficiency of boiler and furnace.....per cent.		
(21)	Net efficiency (deducting steam used by burners).....per cent.		

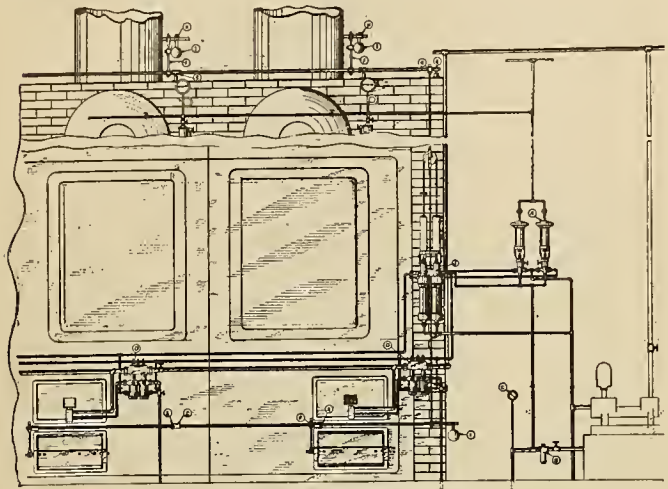
Flue Gas Analysis for Maximum Efficiency.—The analysis of the flue gases serves as an accurate means of determining how to set the dampers, and is the most valuable guide in securing the best efficiency, both during an evaporative test and in regular operation. In general, it may be said that the best efficiency is obtained when the greatest percentage of carbon dioxide (CO₂) occurs, without the presence of carbon monoxide (CO). If CO begins to appear in the gas analysis it is useless to increase the CO₂ further, as any gain due to reducing the excess air is more than offset by the loss due to incomplete combustion. The presence of CO is always more harmful than is indicated by the calculated loss for unconsumed carbon, for if carbon is only partially consumed it is certain that some of the hydrogen is also passing off unconsumed in the form of hydrocarbons, thus causing a far greater loss. This loss due to unconsumed hydrogen does not appear in the ordinary gas analysis, and it is in connection with this item that the heat balance is of special value. Item (h) of the heat balance, which is found by subtracting the heat accounted for from the heat supplied, includes the loss due to unconsumed hydrogen, and if accurate tests are made it will be found that this item is always greater the more CO is found in the gases.

If the furnace is properly designed it should be possible to secure 13½% to 14% CO₂, with not over 3% oxygen, and without a trace of CO, using not over 15% or 20% excess air. These results must be secured to give the best economical results, and if they cannot be secured by changing the draft or the burners, it will then follow that there is something wrong with the furnace arrangement.

It will be found that there is a very intimate relation between the furnace, the burner, and the draft. Thus the intensity of draft and amount of atomizing steam that give best results with one furnace, may give poor results with another; yet by readjusting the dampers and burner valves to suit the new conditions, better results than ever may be obtained. With too much steam the flame may be carried too far beyond

load on the plant. An illustration of an automatic firing system is shown on this page. The essential requisites for a device of this kind are that it shall be reliable in operation, and that when it has once been set to give proper CO₂ readings at certain loads, it will always come back to the same position for the same load. While it is possible under test conditions to secure just as high efficiency with hand regulation as with the automatic, it will usually be found that the automatic regulator produces better every-day economy under operating conditions.

In the illustration, which is that of the Bush Street Station of the Great Western Power Company in San Francisco, oil under pressure is used to operate the regulators and the interlocking devices as directed by the master controller. Boiler pressure acting on the diaphragms in this controller brings about the delicate and positive regulation desired.



A TYPICAL AUTOMATIC SYSTEM OF CONTROL

Diagrammatic View, showing Manner of Control for the Oil, the Ashpit and the Damper:

- A. Master Controller

B. Double Oil Strainer

C. Oil Gage

D. Regulator

E. Single Bearings

F. Damper Arms

G. Clevises

H. Damper Hubs

I. Damper Weights

J. Interlocking Damper

K. Special Brackets

the air openings, causing a poor mixture of air and gases. This would result in a poor gas analysis, although the total quantity of air may be correct.

There are so many variations that can be made, that it is usually impractical to make a complete evaporative test for each set of conditions. It is possible, however, to obtain comparative data in a single test, by varying the conditions at the end of each hour, or each two hours. By carefully observing the quantity of oil and water used each hour, a fairly accurate comparison of efficiencies under different conditions may be obtained. This, combined with the flue gas analysis, makes a valuable guide for efficient operation.

Regulation—When an oil fired boiler is in operation there are three variables under control of the fireman, viz.:

- The quantity of oil burned.
- The quantity of atomizing steam used, and
- The quantity of air supplied.

The quantity of oil burned is determined by the amount of steam required in the plant, and must be varied accordingly. When there are several boilers in battery the amount burned under each boiler may be varied by operating the oil valves at the burners, or the total amount in the plant may be changed by altering the oil pressure at the oil pump. Whenever the quantity of oil burned is varied, there should be a corresponding variation in the quantity of atomizing steam and the quantity of air.

There are now on the market devices which regulate all three variables automatically according to the

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BOILER OPERATION REPORT

PACIFIC GAS AND ELECTRIC COMPANY OPERATION AND MAINTENANCE DEPT

OBSERVATIONS ON BOILER NO. _____ IN STATION _____

DATE _____ OBSERVATIONS BY _____

RATED H.P. _____ TUBES HIGH _____ TUBES WIDE _____ NO. DRUMS _____

1. SUPERHEATED STEAM LBS

2. SATURATED STEAM "

3. STEAM AT BURNER "

4. OIL IN LINE "

5. OIL AT BURNER "

6. "

7. "

8. "

9. BOILER ROOM " F

10. FEED WATER "

11. SUPERHEATED STEAM "

12. SATURATED STEAM "

13. DEGREE OF SUPERHEAT "

14. FUEL OIL TO BURNERS "

15. GASES AT A "

16. " " B "

17. " " C "

18. " " D "

19. " " E "

20. " " F "

21. " " G "

22. " " H "

23. " " X "

24. LEAVING BOILER "

25. ENTERING ECONOMIZER "

26. ENTERING STACK "

27. UNDER GAUGE IN WATER

28. " AT " " "

29. " B " " "

30. " C " " "

31. " D " " "

32. " E " " "

33. " F " " "

34. " G " " "

35. " H " " "

36. " I " " "

37. IN BRECHING " "

38. AT ECONOMIZER INLET " "

39. " OUTLET " "

40. IN STACK " "

41. " " " "

42. " " " "

43. " " " "

44. CO₂ AT " " VOL IN %

45. O " " " "

46. CO " " " "

47. CO₂ AT " " " "

48. O " " " "

49. CO " " " "

50. " " " "

51. " " " "

52. " " " "

53. " " " "

54. " " " "

55. " " " "

56. " " " "

TYPICAL FORM FOR BOILER OPERATION REPORT

Here is how the Pacific Gas & Electric Company, a corporation operating the largest system of oil-fired steam power plants in the world, keeps its records on evaporative tests for bettering power plant economy.

Records.—Complete evaporative tests cannot be made every day in an ordinary plant, but it is possible to take sufficient observations to secure a daily record of the important items entering into the operation of a boiler. A form that is convenient for such a record is illustrated in the accompanying cut. By carefully studying these records, together with the results of evaporative tests, it is possible to maintain the operation of a boiler plant at a very efficient point.

By operation at the most efficient point we save and it is well to remember in these days of national crisis, that "to save is to serve."

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

ODDS AND ENDS OF SELLING PSYCHOLOGY —THE "APPARENT" BARGAIN

BY H. A. LEMMON

(From the days of Aladdin's lamp when a good trade brought a sale, mankind has been induced to buy by the lure of the bargain. Therefore, we allow for obsolete merchandise, and therefore we have adopted the 98c habit. There are interesting quirks of psychology involved, however, and there are some things which cannot be given away which may yet be sold at a good profit. The following article, suggesting some of the principles involved, is by an author who is always entertaining as well as instructive.—The Editor.)



THE ORIGINAL BARGAIN

It is the bargain instinct which leads us to trade goods we don't want for something better. That is why you can sell \$5 irons for \$4.50 and an allowance for sadirons, whereas you couldn't sell them for \$4.50 straight.

HY did Aladdin's princess wife, reared and living in the lap of luxury, yield to the bargain instinct and trade the battered old lamp for a bright, shiny new one, asks the thoughtful student.

She was the victim of a clever magician who understood human nature as applied to salesmanship. He didn't resort to his supernatural powers. He relied upon something much more substantial and trustworthy. He simply offered an apparently obvious bargain, secure in the knowledge that while

the princess has no use for a lamp, neither old nor new, all mankind from the beginning has traded when he or she believed they were profiting thereby.

You may offer an article for sale at say ten dollars. If it is immediately after payday, perhaps I have ten dollars. If you can make me believe that your goods are worth more to me than my ten dollars are, we trade then and there. It is a matter of relative value, you see. Over two thousand years ago a Greek—one Aristotle—outlined the whole plan of modern salesmanship. He may never have peddled books, but he understood human nature. He said, "Whenever you buy something it is because the benefits promise to be greater than the sacrifice."

Probably the bargain is the oldest device used by man to push sales and some variation of it is still the prime mover in nearly all selling transactions. It is capable of very subtle treatment and disguise. Our buying instinct has been so blunted by ever-present and sometimes offensive opportunities to acquire "apparent" bargains that new variations must be constantly devised to excite or even arrest our interest.

Just as sure as Newton's detached apple fell to the

earth, as being the most convenient place for an apple to fall, will the human mind under certain pre-conceived circumstances arrive at conclusions we may foretell. Therefore it is reasonable to expect anyone to be willing to trade a dirty, banged-up copper lamp for a new one; and we utilize this well-known and well-understood fact when we offer to sell new electric irons for five dollars in cash, but allow fifty cents for any old sadiron which may be brought in to apply on the sale. We have no use for the old iron, of course, but neither has its owner, and therefore when he is offered fifty cents for it in trade he does just as Aladdin's wife did. We will have a better understanding of the law of bargains if we appreciate the fact that we cannot sell as many new five-dollar irons for \$4.50 as we can for \$4.50 and the old iron. The obvious bargain is not in getting the device at a reduction, but in getting fifty cents for the old bit of junk which has been obsolete for years. We have only to think up a hundred variations of this law, as exemplified, by the magician, to put over some good selling campaigns.

Figures adapt themselves readily to a stimulation of the bargain instinct. Thinking in terms of dollars, our minds usually do so in these steps: One dollar, five dollars, ten dollars, etc. It may seem strange but is nevertheless a fact that we do not dwell in retrospect upon two dollars, or three dollars or four dollars, but jump from one to five (unless we pause at \$2.50, as some of us do), and from five to ten. These sums flash on our minds naturally. If we wish to consider anything in between we must exert mental effort. So if our department store friends are driving a bargain sale they are quite likely to price goods largely at 98 cents, or \$9.98, etc. Consider the latter sum, for example. Ten dollars is a definite and, to many of us, a considerable sum of money; \$9.98 is less and when anything less than ten dollars is suggested our minds immediately and unconsciously drop to five dollars. While we know that \$9.98 is more than five dollars, we do not stop to consider how little less than ten dollars it really is—at least until the magical first impression has been made.

If we were doing business a thousand or more years ago when the necromancer and even the philosopher were instilling into popular mind the alleged mysteries of the number 7, we would write our bargain figures—6 cents, 68 cents \$6.68, etc., and secure the same curious effect.

Fortunately or unfortunately, however, it happens that this device has been used so often that the public is becoming wary and inclined to resist its allurements. Therefore it is no longer so effective as it was a few years ago. Perhaps this is just as well, for we are thereby forced to a higher plane of salesmanship. Cut-prices may be taken as an indication that the electrical

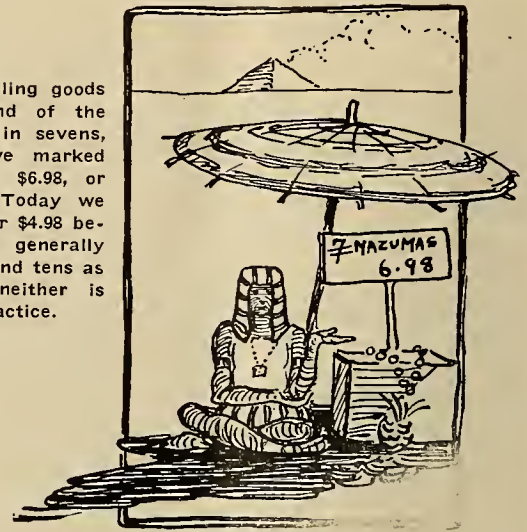
dealer who makes them, except in rare instances, has not as yet found himself. He has not learned that we buy because we think the article offered is more useful to us than is the money asked for it, and not because it is merely low priced. Cut prices cheapen his wares unless they are handled very skillfully and almost invariably such a campaign will be followed by a very definite slump in business and reputation.

A couple of years ago a central station purchased a sample dozen of stand lamps. These lamps were entirely made of glass and very closely imitated cut glass. In the smaller sizes they cost the station something less than \$2 and in the larger about \$3, complete with silk cord, etc. When they were ordered it was planned that, if they proved attractive, several hundred of them would be secured and given away as premiums. An ironing board was finally selected instead, and the dozen samples placed on sale during Electrical Prosperity Week at about cost. Notwithstanding a very satisfactory week otherwise, not one of those lamps moved during that period. The same lamp offered at \$2.50 by the central station was being sold by jewelry stores in a nearby city for \$12. Many were attracted by their beauty, but when they learned of the ridiculously low price they passed on. Well, to make a long story short, these same lamps were placed on sale during the holidays of the succeeding year and went like hot cakes at \$7 and \$9 each, and measured by values generally they were worth it. In both years great care was taken to inform each prospective customer that they were not genuine cut glass and that the glass-cutter's wheel had only been run through the heavier grooves; but the price, at which they were first offered, in itself served as a warning to all that something was wrong with them. They looked like more money, and we are suspicious of goods which seem to give great values for little money.

We all remember the story of a famous Chicago department store which a few years ago staged a special sale of \$5 gold pieces for \$4.90 each, and how the sales were so few that the entire day passed with a loss of something less than \$11. It was an obvious

bargain, of course, but one that the mind rebelled at as illogical. "Why," we ask ourselves unconsciously, "should any one desire to sell a \$5 gold piece for \$4.90

If we were selling goods when the mind of the public figured in sevens, we should have marked them down to \$6.98, or rather, \$6.68. Today we make it \$9.98 or \$4.98 because people generally think in fives and tens as units. But neither is wholly good practice.



unless there is something tricky behind it all," and we pass it up.

And yet 90 per cent of all our sales must be built upon the foundation of the bargain. The genuine bargain, however, is in the degree of service we may obtain from the use of the device and not from the device itself, and while the cut price is so common as to have lost its effectiveness, we have the whole broad field of human nature in its more receptive forms to which to appeal. Human nature will never change, and will never refuse to respond to intelligent demands made upon it.

Every selling appeal, whether advertisement or sales window, is aimed to convince the customer that the object for sale is a bargain, that is, is worth more to him than his money. At the point where he arrives at that conclusion himself, it becomes an apparent bargain. And if the argument by which he is thus convinced is based on no mere chicanery of words but upon the real service of the electrical device, it is a real bargain.



Flood lighting as a means of real estate advertising has been effectively used in the case of these villas. The homes were built by the Laurelhurst Co. of Portland, Oregon, and thus lighted of an evening proved a most striking advertisement of the attractive residence district being opened up by that company.

TRADE ACCEPTANCES

BY A. D. McMULLEN

(The trade acceptance is familiar enough by name—but has really been adopted to a surprisingly small extent in this part of the country. The reasons for its introduction and a clear analysis of its application are here convincingly set forth by the general manager of the Capitol Electric Company of Salt Lake City. The paper is one which was read before the Utah Society of Electrical Contractors and Dealers on April 6, 1918.—The Editor.)

The history of the past shows tremendous losses by failures at various periods, and the crises or panics which occurred at intervals of about every ten years were to some extent due to the unsatisfactory financial system of the country.

I wish to quote a few facts from the business mortality.

December, 1914, the total liabilities of failures were \$358,000,000. Last year the total liabilities by failures were \$172,000,000, and while this is a very large decrease in business mortality, it is, no doubt, due to the present financial system as well as the prosperity of the country. But the most important fact is this: That of this \$172,000,000 failures last year, 42 per cent were due to incompetency and inexperience, and 32 per cent due to lack of capital. About 75 per cent of the failures last year were due to these two causes.

The Federal Reserve Act, creating twelve Federal Reserve Banks, was enacted in 1913, and has contributed tremendously toward the success of the business and banking interests of the country.

The authors of the Federal Reserve clearly recognized the necessity of reform of the American commercial methods, and from the first kept constantly in view the desirability of establishing the trade acceptance as the most efficient and economic means of financing commercial transactions.

They were excessively cautious in introducing what evidently appeared to them to be more or less of an experiment in this country; but since its adoption, with certain amendments, has proven to be the most thorough, practical and desirable system existing today.

A trade acceptance is a time draft drawn by the seller of merchandise on the buyer for the purchase price of the goods and accepted by the buyer payable on a certain date at a certain place designated on its face.

The trade acceptance is not a sight draft or a promissory note and is employed only in the purchase and sale of goods.

A trade acceptance is simply an acknowledgment of a debt by the buyer in favor of the seller for merchandise the seller has placed in the hands of the buyer with which to pay this debt.

The buyer agrees to pay on a certain date at his own bank to the seller the amount of this certain indebtedness by writing across the face of the acceptance the word "Accepted," the date, the name of his own bank, and his signature. This varies from the open book account method only in placing the debt in shape so that it can be sold or negotiated.

In giving a trade acceptance, the buyer assumes no obligation until after the seller has relinquished title to the merchandise of equal value to the amount represented by the trade acceptance, and the buyer binds himself to do more than he expressly promised to do when he made the purchase—that is, to pay for the goods when the bill is due. The use of trade acceptances has the following advantages to the buyer:

1. Places the buyer in a class of preferred customers.
2. Checks overbuying.
3. Strengthens the credit standing.
4. Makes it unnecessary for the business man to hypothecate or sell his accounts receivable.
5. Makes it possible readily to convert acceptances into cash.
6. Eliminates the waste resulting from bad debts and slow collections.

BENEFITS OF TRADE ACCEPTANCE

- 1—Gives preferred standing.
- 2—Checks overbuying.
- 3—Strengthens credit.
- 4—Eliminates borrowing.
- 5—Convertible into cash.
- 6—Eliminates bad debts.

- 7—Helps small capital.
- 8—Simplifies bookkeeping.
- 9—Benefits bank standing.
- 10—Increases financial standing.

7. Places the small man in a position where he can compete with those having large capital.

8. Simplifies bookkeeping and obviates the need of long book accounts and borrowing to enable the retailer to extend long credits to his customers.

9. Assists small business houses to secure the benefit of

discount and low rates at banks.

10. The signing of an acceptance increases the financial standing of the giver because it shows prompt paying methods.

As a matter of national defense, our credit system should be improved and strengthened in every way possible because of the certainty that the demands upon the United States for the extension of credit are greater than ever before and will continue to increase. The form of credit most unavailable and rigid is that extended by the retailer to his individual customer, and every retailer can assist both by accepting the trade acceptances, which are sent to him by the one from whom the goods are purchased, and also in securing acceptances where amounts are reasonably large from his own customers, thus securing an agreement from them as to a definite time of payment. This is a way in which every distributor can co-operate in helping the credit situation of the country.

We should popularize trade acceptances.

Considering present conditions in the money market, it seems rather remarkable that so few of our commercial concerns are utilizing the trade acceptance in financing their sales.

Our wholesale dealers and large manufacturers have been obtaining funds in the East through commercial paper brokers, paying recently a high rate of interest.

Due to the government financing, the Eastern banks are restricting the purchase of commercial paper and it has been difficult to obtain the usual accommodations through the commercial paper dealers; and even during this period of stringency, prime trade acceptances can be negotiated with little difficulty at a lower rate of interest. Evidently a great majority of our merchants are wholly unaware of the substantial benefits which the banking system holds forth, or the trade acceptance would have now become much more popular in commercial circles than the current reports would seem to indicate.

Why the average merchant or manufacturer will allow his perfectly good capital to be locked up in unliquid open book accounts with all their indefiniteness and waste through bad debts, interest losses, collection expenses, etc., when every safeguard for his credit and interest may be obtained for the asking through the use of those instruments which the country has provided for his protection, is one of the problems in our commercial life yet to be explained.

The fact that they do so tie up their capital is, to say the least, a strange commentary on the much advertised cleverness of the American business man.

Despite the widespread propaganda which has been conducted in behalf of the trade acceptance by bankers and credit men and through the exponents of sound business methods, the employment of this credit instrument in commercial transactions is still on a very limited scale in this country.

Ordinarily quick to adopt new methods that present sufficient merit, and justify the effort and risk involved, our merchants and manufacturers, in this instance, are clinging tenaciously to the antiquated open book account with all its evils, and it is really difficult to find a market locally for the trade acceptance.

One of the chief difficulties in the way of the greater extension of trade acceptances is that most of the retail dealers are taken for small amounts and are payable at various times, and as a result the bankers or buyers of this class of paper have been unwilling to open small accounts on their books, or to go to the trouble of collecting these small items.

If all small items could be lumped under one general credit so that, instead of discounting the bills singly, the merchant would be enabled to obtain his money through the use of a banker's acceptance, this no doubt would be a tremendous impetus to the use of the trade acceptance, but this method is not permissible under the Federal Reserve Act.

Since the adoption of the Federal Reserve Banks, there have been several amendments, and other changes in the law will, no doubt, be made to meet these various requirements, and we hope the country will soon enjoy the advantages accruing from the broad market for such paper, and increase the integrity, economy, safety, facility and business efficiency.

Bearing in mind these basic conditions, our immediate problems are those of good methods and good management, making it incumbent upon us all to effectively co-operate with the banks and each other, bringing our credit methods up to the highest efficiency in order to make commercial credit as liquid as possible, eliminating lost motion, clearing credit against credit, in order to accomplish the maximum of business on a minimum of credit. Unmatured commercial credit in negotiable form is a valid asset convertible at once through our present banking machinery into cash or available credit.

Our credit methods should be standardized to automatically produce a type of credit instrument which will represent distinctly actual sales of merchandise going into consumption, and the terms of such sales thus bringing into existence an immense value of self-liquidating commercial instruments of a purely commercial type, which show upon their face exactly what they are, as such will be the more readily absorbed by the banks and the open market.

Bear this important fact firmly in mind—that the trade acceptance represents goods that have been actually sold. A plain note may represent borrowing for any purpose and does not necessarily represent transactions of a self-liquidating character, and may be borrowed against goods that have been or might not be sold or are unsalable, or against book accounts of an unknown character, or for speculation or for diversion into outside enterprises or for purposes of an unliquid or of an obscure character.

During these times especially, there are very sound and excellent reasons justifying the business man in deciding that all sales of goods should be closed on a basis of cash or trade acceptances.

Another important feature to bear in mind is that the Federal Reserve Banks are permitted to buy trade acceptances, but not plain paper in the open market, and have made a preferential re-discount rate on them to member banks in recognition of their desirability.

When the trade acceptance is paid, there are a debt and a deposit canceled. There is no inflation because the acceptance is based on goods going into consumption. This affords a very elastic and flexible financial system. For example: There are ten men sitting around a table. The second says to the first, "You owe me \$10; pay me." Payment is made with a \$10 bill. The third man says to the second, "You owe me \$10; pay me," and the same operation is repeated all around the table; consequently \$100 worth of debts are canceled with the \$10 bill. The same able-bodied \$10 bill can go on indefinitely canceling debts. liquidating credits to connect up with the Federal Reserve credit or trade acceptance for the \$10 bill, the principle is just the same.

The main thing is for us to organize our self-liquidating credits to connect up with the Federal Reserve Bank.

The thing radically requiring a change is our open book account credit system—expensive, antiquated, unscientific and cumbersome.

The adoption of the trade acceptance is primarily a matter of trade and selling terms. It will never come into universal use until the selling terms are universally changed to require that an account shall be closed either by cash, less discount, or by trade acceptance.

HELPING THE CUSTOMERS TO HELP THEMSELVES

Silk lamp shades appeal to the decorative tastes of most women, but the expense often balks them. The business manager of an Ohio central station solved this by instructing the women in the art of making their own silk shades. He obtained a young woman with needlework abilities and sent her to a needle school in Cleveland. When she returned he opened a department of instruction for home silk shade manufacture. The company laid in a line of wire frames, silks and braids, so the pupils could buy the materials at the place of instruction, and success was immediate. There are now as many as thirty women in the company's office in one afternoon buying material and working on shades. Purchases of lamps to fit the shades have been numerous. The instructor makes shades for the company during her spare time, and the profits on these more than pay her salary.

Western Ideas

HELPING THE OVERSUBSCRIPTION by floodlighting the Liberty Temple, was one of the services of electricity in the Portland Liberty Loan campaign. The building, as shown in the accompanying picture, was a special feature of the drive, being erected in one day, with windows, plaster, electricity and steam heat complete. Electric flood lights were placed on the Portland Hotel and other buildings surrounding the square, seven in all—and these were turned on at nightfall.



Erected in a day—and flood lighted to help the Liberty Bond Campaign

The figures shown over the door in the

illustration are not in any way up to date, representing the subscriptions only of the first two or three days of the loan. Indeed, Oregon was the first state to receive an honor flag, and Portland disputes honor with Toledo, Ohio, for the first place among the cities. The fact that Guy W. Talbot, president of the Pacific Power & Light Company of Portland, provided such efficient leadership as director of the Portland drive, undoubtedly had much to do with its success.

"NO QUORUM" is a familiar trouble to those who attend association meetings regularly. Feature entertainments are usually well attended, but when the occasional exigencies of club business bring about the necessity for a business meeting, only a few faithful

AN ATTRACTIVE HOME is the place where electric fixtures and appliances are most welcome. In consequence, this effective window display of the J. Walsh Electric Company of Portland, Oregon is calculated to appeal to the very type of passers-by who might become customers. The window represents a fireside corner with andirons, fire set and screen complete, as well as the display of electric fixtures and heaters in well arranged plan. There is no attempt to show everything in the store, nor even a dozen varieties of the particular type of wares on display—but rather a suggestion is made of just how pleasant and cozy it might prove to have such appliances in the home.


Customers never jump to the conclusion that because you have shown only a round coffee pot in the window, that you have no octagonal ones in stock. In fact, if what you do show is in itself appealing, they are likely to imagine all sorts and varieties which might fit their taste and to come in and ask for them. It is an interesting psychological fact that a window display sells not only the product on display, but the entire related line of goods. It is this principle which underlies the value of the window illustrated here, over one which might contain twice as many heaters and fifty separate fixtures of every conceivable type.



Artistic and effective

A SALES CALENDAR has been adopted by the National Electric Light Association which is proposed as a nation-wide schedule for the sale and advertising of electrical appliances. They urge that all distributors follow this schedule so that the purchasing public will have its attention concentrated on particular appliances. The effect of such combined efforts is bound to produce greater results, in sales, than individual efforts of dealers pushing in different directions. The schedule adopted is as follows:

- January—Clearance Sales.
- February—Warming Pads.
- March—Vacuum Cleaners.
- April—Sewing Machine Motors.
- May—Table Stoves.
- June—Irons.
- July—Washing Machines.
- August—Fans.
- September—Vacuum Cleaners.
- October—Percolators.
- November—Toasters.
- December—Christmas Gifts.



If YOU stay away from the meeting of
the Society in Room A, Central Library, Thursday
evening, February 21, we may lack just ONE
of having a quorum

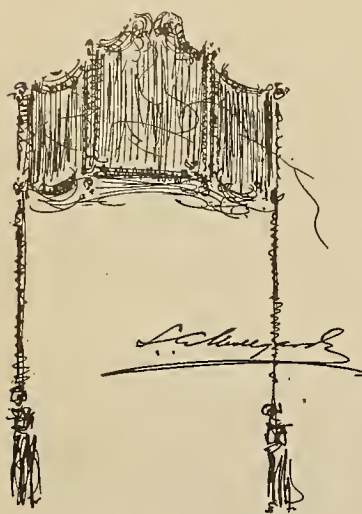
PLEASE COME!

C. J. HOGUE,
Secretary.

Just to remind you that business meetings should be attended

ones show up. And then, in payment for their trouble, even their time is wasted by a count which results in a "no quorum" verdict, with no business possible. The accompanying card, which cleverly forestalls such a happening, will therefore be appreciated by presidents and overworked secretaries, and may serve as a conscience stimulant to some of the members who habitually stay away.

ELECTRIFYING ELECTRIC FIXTURES means designing them to meet the needs of electric illumination, irrespective of what may have been done



A new idea in wall fixtures

in the past. The lighted lamp itself must be concealed for eye comfort, and obviously a fixture whose every line is designed to lead up to this lamp as the interesting point of the fixture is in some measure inconsistent. The need for a decorative side fixture which shall provide adequate indirect and semi-indirect illumination without calling attention to itself as a light source, has been met by Louis Christian Mullgardt, the well-known architect of the Court of All Ages of the 1915 San Francisco Exposition, in the construction as used in the president's house for Stanford University. In this case the wall bracket outlets have uniformly been placed higher than the doors and windows, nominally about two feet below the ceilings. The lights are arranged back of semi-opaque screens, made of fabric or glass, in metal frames. The lamps are completely concealed from view, the light being projected on all sides against the wall and allowed to filter through the fabric of semi-opaque glass to any desired degree of intensity. The side wings of the screen are hinged and controllable by means of cords, from below, to admit of complete control of the light on either side. The fixture is distinctly electrical in its design, and therefore differs from the conventional electric fixture designs, which are customarily based on the principles of oil, gas, or candle illumination.

SUGGESTIONS TO CUSTOMERS as to how they may improve on their tentative wiring plans are often appreciated. One of the suggestions offered by the manufacturer to the contractor-dealer is that, besides an adequate supply of receptacles, the following hints will be appreciated by the man who really wants convenient wiring:

Equip all side wall fixtures with pull sockets—they are much easier to turn on and off.

Provide a side wall fixture on each side of the mirror over the lavatory. This provides illumination for both sides of the face in shaving, massaging, etc., and is always much appreciated.

Recommend locking sockets or receptacles for all out-door lights. They will prevent possible theft of lamps at night or when the house is temporarily unoccupied.

Provide three-way switches at both entrances to a room (where there are two doorways) to facilitate turning on the lights without traversing the room in the dark.

Arrange for plenty of lights in the cellar. The cellar stairs should be well lighted and there should be a light in each coal bin and in front of the furnace.

Always place a light where it will shine into the refrigerator. This convenience will be appreciated, and will save the spilling of much liquid food in addition to facilitating finding articles quickly.

Always arrange three-way switches so as to turn on upstairs hall lights from downstairs, as well as above, and vice versa.

A NEW USE FOR A VACUUM CLEANER was discovered by the workmen of the Pacific Telephone & Telegraph Company recently when called upon to pull in a circuit from the basement through conduit to the top floor of the Federal Building at Yakima, Wash. It was found impossible to run an ordinary wire through the conduit, due to its being almost full of service wires. It occurred to one of the workmen to use a vacuum cleaner. The vacuum cleaner was attached to the upper end of the conduit and a thread drawn through. It came up so fast that half a spool of thread was in the cleaner before the machine could be stopped. With the thread as a starter, a heavier string was drawn through, which enabled them to pull in the circuit.

WHILE THEY EAT is a good time to reach prospective customers—or so thinks B. W. Paul of Medford, Oregon. The ingenious advertising scheme illustrated here has been worked out by him in the dining room of the Hotel Medford. The shades of these very attractive table lamps are made up of colored glass slides descriptive of various electrical ap-



A silent method of talking shop at everybody's dinner

pliances which he carries. It is true enough that the average individual is actually more at leisure during meal times than at any other hour of the day, and in consequence perhaps gives more attention to the subject matter of the lamp shade than to any other advertisement which reaches him. The very novelty of the scheme appeals to him and arouses his interest—as well as the appropriateness of the advertising method to an electrical business. And then, when he comes to visit the store he finds it so well arranged, with windows neat and attractive and interior to match, that more than likely the purchase is completed on the spot.

A LESSON ON THE PROPER WAY TO APPROACH A CUSTOMER

BY ELMA STEINMAN

(You would enjoy attending a class in salesmanship as it is taught to clerks in our large department stores, wouldn't you? Well, here's a chance—for this is a sample as actually given by the educational director of the Emporium, San Francisco. Read it and then see if the clerk in your store doesn't say, "Something for you?" to the next customer who comes in. The article carries a suggestion to every dealer as to how the principles of good salesmanship may be brought home even to a clerk not born with "the gift."—The Editor.)

"Presuming that it would be of interest to you to know just how so intangible a matter as salesmanship can be made the subject of a class lesson, I invite you to attend a meeting of such a class....." (Here followed time and place.)

This message greeted The Observer's eye as he sat down at his desk one morning. The Observer smiled, for he was a doubting Thomas on the subject of training a salesman, and more than once had he taken a definite stand on his pet maxim, "A good salesman is a born one—you can't make him through training."

But The Observer prided himself on being open-minded, so he accepted the invitation. At the appointed time he entered the class-room. A discussion was in full swing as to the difference between outside and inside selling (the lesson of the previous day).

After reviewing the conclusions the discussion proceeded to the subject of the day:

"Approach to Customer"

Think for a moment of the history of the business of trading. What was the earliest form of the buying and selling business?

Here followed from one member of the class a short history of early trading in the days when men first began specializing and exchanged commodities merely as a matter of convenience to each other (evidently the subject of a preceding lesson).

What do you consider the simplest of our modern retail businesses?

The small store on the crossroads, where the proprietor runs his own business (buying and selling) in a community of which he knows every member personally.

Name some of the forms of retail business—not large department stores like ours—and compare them with the little country store.

From several answers the following list was compiled:

A specialty shop, including: Grocery stores, drug stores, etc., as well as the clothing specialty shop.

A small business in a large city.

A small business in a small community.

A discussion followed of the difference between these businesses in the attitude a S. P. in each would have toward his customers.

Have you ever thought of the department store as the "city cousin" to that little country store? What is the difference?

A discussion followed in which was developed the big difference between handling a customer you know personally and a customer who is primarily a customer.

The importance of the S. P. positions as representative of the management at the point of contact with the customer was emphasized.

Preliminary Approach

What outside influence may affect your customer before she reaches the store?

1. Advertisements. The selling values of various advertisements were compared and discussed as to the effect they would have on prospective customers and the impression they gave.

2. Windows.—This was discussed in the same manner. The point was developed that there must be a motive behind each window as to the kind of people who are to be attracted by it.

Bargain windows.

High-class merchandise.

Any specialty or seasonal merchandise.

3. Location of the store.—Discussion as to accessibility of the store and its effect on trade.

4. Previous experiences.—Either a pleasant or an unpleasant experience will react on the next person to come in contact with the customer. The value of careful directions was emphasized.

5. Attitude of salespeople.

Actual Approach

What do you say or do when you approach your customer?

A blackboard list was made of all the methods used. Here are a few typical answers:

"Something for you?"

"Something in?"

"Do you wish something?"

"Can I do anything for you?"

"Can I be of service?"

"How can I help you?"

"What can I do for you?"

Do you always say the same thing to every customer?

1. No, I don't think I do! I —. Why, I never thought about it. I don't know what I say.

2. Yes, I always say, "Something for you?" You have to say something to a customer, and that breaks the ice and then she either says what she wants or she says, "I'm just looking," or lets you know somehow whether she wants you to wait on her.

Do you only wait on customers when they ask you for some certain article?

Yes; I don't like to be bothered myself, so I never bother my customers by following them around. If they want anything they generally come and ask me about it. I'm always glad to tell them.

Has it ever occurred to you that there might be people who would like to be shown things and told about them—that many times there are new things that your customers know nothing about, but in which they would be very much interested?

Why, I guess that is right enough!

Yours is the household department, is it not? There are so many interesting things to learn in that department. Try your next "just looking" customer on the new dish washer that has just come in. You may not sell her, but you can't fail to interest her and—she may tell her friends about it.

Well, but suppose I was fooling around with a customer like that and another customer came in; I might lose a sale.

True, you might. But you will find you break pretty even on that point. For every customer you lose in that way, I'm sure you will make up many

times by the sales you make to "just looking" customers.

But some customers don't want to be bothered—I don't when I go into a store.

True again. If your customer doesn't want them, don't force your attentions upon her. Remember, you want her to come back, but most customers are pleased to be shown and told about things if you don't make them feel that they must buy the article at once to repay you for your effort.

But to get back to our subject, does no one approach a customer without asking a question?

A quiet girl, who had heretofore taken no part in the discussion, spoke up:

Yes, I do. I just look at my customer, and say "Good morning." That gives me time to size her up and I can tell whether she is cross or not or just how I will have to talk to her.

What do you sell?

I am at the front tables. We have all sorts of different merchandise there.

What do you do then when you've said "good morning"?

Then I begin to talk about my merchandise. In the morning when I'm dusting, I always look everything over and pick out what I call my "sellers." These I use to talk about first. I think that if a customer stops at my table she is interested in what I have and I don't ask her any questions, because she may change her mind. Of course, I don't want to make her take anything she doesn't want, because she can return it, and I don't like "come backs." But I can find out more quickly what she wants in my way than if I asked her a question. Then, too, if she said "No," I wouldn't have a chance, and if she said "Yes," I'd have to find out anyway just what she wanted.

What do the rest of you think about that?

Opinions pro and con were eagerly advanced with experiences to back them.

We'll stop here today—but let me tell you my opinion. I agree with Miss ———'s method. Now, don't agree or disagree. Please, all of you, go back to your departments and try it out today. Then we'll discuss results tomorrow. But, remember, every customer is different—don't treat them all alike—study each one and then apply to Golden Rule. Put yourself on your customer's side of the counter as well as your own. A poor question like "Something for you?" at the start may be the reason for your customer's dissatisfaction with everything you show her—may even lose you the sale.

Please try it out, and then we can discuss the results.

The class left—The Observer with them. But he was much disturbed as to the truth of his convictions. He entered his own place of business with a changed attitude.

Were his salesmen really so good as he thought they were? There was one of them now saying: "Something for the house today?" Why did he have to ask that question—he might have known—

The Observer stopped—he was thinking almost in the very words of Miss ———, whom he had just heard.

There might be something in it after all—he had been losing business lately and had thought his merchandise was to blame—perhaps—The Observer determined to look about him.

"IF I WERE AN ELECTRICAL DEALER"

BY C. E. WIGGIN

(A neighbor can often see the faults of another man's business better than the man himself. What a dealer would do if he were a jobber was reported in our last issue, and here the jobber has a chance to come back. The article forms part of a talk given before the San Francisco Development League by a man who is connected with one of the prominent jobbing houses of San Francisco.—The Editor.)

Assuming a properly located and attractive store, my first aim would be to acquire a stock of goods from which to serve my customers efficiently.

Service to my customers means that I must have the proper service; therefore I must be careful to select reliable sources of supply. In a way I would treat the jobbing fraternity as a family affair. I have to live with my family all my life, therefore I strive to make my family life a pleasant one.

I should make my relations with the jobbers close and friendly, seeking their counsel and advice, asking no favors which I would not be willing to grant were the situation reversed, keep my promises and conduct my business with them in an honest and honorable way—I should expect and without doubt receive like treatment from them.

I would be an active member of any association of dealers in my line, believing them to be indispensable to our business welfare when conducted on a strictly moral as well as legal basis.

The business of the electrical dealer and contractor is so interwoven with that of the central station that it demands the closest co-operation by the individual dealer and his association with the central station and its employees, and I would use my utmost endeavors to bring about the closest possible working arrangement between these two branches.

Regarding my customers, I should always endeavor to give them prompt and efficient service, teach them to expect it, by careful attention to their wants and wishes, by offering them modern and up-to-date appliances at living prices. Have them waited on by pleasant and courteous clerks who could and would explain the use and abuse of things electrical in good, plain—not technical—English.

I would always have on my counters some new article or one that customers or clerks might operate while conversing. A feed-through switch hooked up to some device might lead to the sale of a percolator or a toaster, or a "C-2" lamp burning might insure a permanent lamp customer, or a Sew-Ezy Motor the sale of a sewing machine to a customer who had dropped in to purchase a fuse plug or a dry battery.

I would have a house-to-house canvass made of all customers in my immediate vicinity, offering goods on trial where the conditions seemed favorable, but in any event advising them of a place near at hand where electrical devices could be had.

If the various branches of the electrical industry would work together on the basis of the Golden Rule, each doing for the others as they would have the others do for them, it would bring about a situation so satisfactory that none of us would regret any sacrifice we might have had to make, a situation that cannot be achieved where one branch does the cooing and the other the operating.

Co-operative Campaign Problems —

BY A. L. SPRING

(In the travels of the California Co-operative Campaign representatives, they come in contact with almost every conceivable problem which the contractor-dealer must face. The articles of this page represent the analysis of some of these problems by the representative from Southern California. The suggestions should prove of particular value as coming from a specialist in this very field.—The Editor.)

AN OPPORTUNITY FOR THE CONTRACTOR-DEALER

One of the best opportunities for the electrical contractor-dealer to increase his sales of electrical appliances is to see that in every house he wires ample outlets are provided for the use of various appliances. When this is done, someone is going to make the sale of them, and there is no one in such a favorable position to do so as the contractor-dealer, who is so closely in touch with the job. When giving the estimate to the owner, his attention should be called to the advisability of having installed several conveniently located outlets, each for the use of one or more popular electric appliances. The contractor-dealer should impress on the owner the great convenience these additional outlets will offer for years to come. Some contractor-dealers raise the objection that if a figure is given including these extra outlets they will lose the job, while as a matter of fact, many times just such things properly called to the owner's attention, will get the job for the aggressive contractor-dealer. However, if there is any probability of this losing the job for him, two figures can be given, one including the extras and the other not including them; the one including the extras, however, should be strongly recommended. These extra outlets encourage the purchase of appliances and often mean that they will be used much more, due to convenience. Also many appliances now on the shelf a large part of the time would be in use every day if outlets had been provided for them.

The owner's appliance business should be solicited at the time the job is roughed in; secured if possible when the finish work is done, or followed further until the order is obtained. Now the question is what can the contractor-dealer do to sell the largest number of appliances to these owners. One of the best methods for increasing appliance sales on these jobs is to encourage the wiremen to sell them by paying each one a bonus on all sales of appliances which he makes. This has been tried in a number of cases and the extra incentive has done much to stimulate the sales.

The wiremen should be coached in the sale of appliances so that they may make as many sales as possible. The contractor-dealer should arrange evening meetings at which he, his salesmen and wiremen should be instructed in selling appliances. Jobbers' and manufacturers' salesmen will gladly furnish this assistance by giving the best talking points on their line of goods and showing those present the best way to sell them. This is educational and instructive and is a service which every manufacturer and jobber is anxious to give and one which is far too seldom accepted. If the contractor-dealer is to become the vital factor in the sale of appliances which all branches of our industry desire him to be and are willing to ma-

terially assist him in becoming, he should capitalize this and every other available opportunity.

CHANGES OF WINDOW DISPLAYS

Frequent changes of window displays are necessary in order to obtain the maximum advantage of show windows, which are the dealer's best advertising asset. Only a small percentage of electrical dealers make these changes frequently enough, and the balance are very neglectful in this regard.

In most cases there is no regular time set to change the windows, but they are attended to when the one who cares for them gets time to do so. When this is the case they are usually very poorly kept, because often weeks roll by before it is felt that time can be spared to give them any attention.

Certain definite times should be set aside to dress the windows. It is a good plan to have one day a week on which this is always done, and the choice of the day is surely worthy of consideration, as there are often very good reasons why one day is much better than another. If a dealer's store is so located that many people pass it on Sunday on their way to church, then the windows should certainly be dressed on Saturday, so that they will be new to the public and in best shape to obtain results at the most opportune time.

If the dealer's store is in the Masonic building or near the Elks Club, for instance, the changes in the windows could well be made on the day, the night of which, the crowd passes to and from lodge. These are just two instances where a certain day each week would be the best for window decorating. There are numerous others; in fact every dealer should make a study of his case, then set a certain day, and see to it that his windows are always changed on that day.

The public judges the merchant by his show windows and frequent regular changes do much to raise this judgment.

CENTRAL STATION CO-OPERATION

The central stations receive numerous inquiries for construction work, appliances and supplies which they do not handle, but on which they refer the prospect to the electrical contractors and dealers. It is to the best interests of the industry that these inquiries are not all referred to one contractor and dealer in each town, but are distributed among them.

There is no better way to handle these inquiries than to let the consumer decide for himself who he will have do the work or from whom he will make his purchase. In all but the largest cities this can be done by the central station making a list of the contractors and dealers in the town, arranging the list alphabetically and giving the addresses. This list should be placed in the hands of those men in the central station's employ who receive such inquiries by telephone, mail or direct. Also a copy of the list should be framed and hung near the counter of the central station's office. The employees can refer the prospects intelligently and impartially from the list in their possession, and those persons coming in to the office can be referred to the list on the wall and decide for themselves whom they will favor.

Another plan which can be followed is to have this list printed on cards so that when a consumer makes inquiry a card can be handed or mailed to him. This

is a refinement of service as well as the means of impartial co-operation.

In large cities the same plans can be followed by dividing the cities into districts, referring the prospect either direct to the list or to those in his district, or using a card on which the entire list is printed. In this way each contractor and dealer would feel that the central station was co-operating with him and he would reciprocate, instead of feeling that the central station was partial in its co-operation.

THE CONTRACTOR-DEALER AND CREDIT BUILDING

BY ALBERT H. ELLIOT

(It may appear to the contractor-dealer that it is pure gain to himself and others in his business if a jobber adopts an over-generous credit policy, but in reality it is his loss. For it brings him into competition with rivals who are conducting business on the capital of the jobber, and on an unsound basis which he must meet to keep the trade. A wise credit policy is of even more importance to the seller of the goods—indeed, a credit association which shall take a firm stand in fixing credit limits is shown to be almost a necessity in the industry. The author, who is secretary of the Pacific Coast Electrical Supply Jobbers Association, is well known as a progressive thinker in the electrical business field.—The Editor.)

The extension or restriction of credit is a very important part of the science of business. Too often we assume that the credit part of business is only a necessary evil—a kind of excrescence to be tolerated but restricted in its growth. It is remarkable how little thought and study are expended on the credit side of a business in comparison with the work done in the sales end. Rarely do we find that close working harmony, even in a single organization, between the credit and sales departments which are necessary to secure the best results.

Scientific credit administration is of benefit not only to the organization selling goods, but also to the customer who buys. Some electrical men still believe in the old-fashioned idea that there is a necessary conflict of interest between the seller and buyer, so far as credit questions are concerned. The conflict arises because the seller is trying to restrict the credit of the buyer, while the latter is struggling to get as large a credit accommodation as possible. The use of the word "accommodation" indicates the whole trouble with this point of view. If the seller extends to the buyer just the amount of credit to which the buyer is entitled, there is no question of accommodation about it, and the other customers of the seller who may also be competitors of the particular buyer are not put at a serious disadvantage by undue credit "accommodation" unfairly extended to a favored one in the business.

Every credit problem should be viewed from the standpoint from which we view the electrical business in its broad scope. The undue extension or restriction of credit is an unfair trade practice. The contractor-dealer who conducts his business properly is entitled to an extension of credit based upon his business showing, is unfairly treated when his competitor whose business is a menace to the electrical industry is kept alive through credit extensions which are mere accommodations. From the broad standpoint of the general good of the electrical industry, every member thereof has a right to complain when a seller insists upon the policy of keeping a customer alive by feeding

him with the oxygen treatment of credit extension beyond the point of good business.

The other customers of the seller may complain because they are thrown into a grossly unfair competition with contractor-dealers who are doing business on the seller's capital rather than their own. And thus we see that from the viewpoint of the whole industry every contractor-dealer, whether a customer of the particular seller or not, is interested in the seller's credit problems. Also, seller competitors are interested, because when a seller makes a credit extension which is not justified, other sellers are forced by competition into the same bad practice with resulting losses and business disruption.

A wise credit policy may result in the greatest possible benefit to the contractor-dealers. Obviously each honest contractor-dealer who is justly proud of his business, however small it may be, does not fear a credit classification which is fair and just to all in the business. He does not expect more credit than he is entitled to. He realizes that a too-extensive credit does more harm than good. It lures a man toward the rocks of bankruptcy. But when he sees a competitor given accommodation to which he is not entitled, he realizes that he is thrown into unfair competition because his competitor is working on capital which he has neither earned nor borrowed. He then has a right to protest to his dealer.

A credit association which educates the sellers in the idea that a wise credit policy benefits both the sellers and the buyers performs a real function in the electrical business. One seller acting alone is but a feeble voice protesting against a credit extension which is bad from every point of view. All sellers acting in same spirit of co-operation can enforce a wise credit policy, however radical it may seem, provided, of course, that it is in fact wise. The partnership relation which arises between a seller with a bad credit policy and a contractor-dealer who is doing business on the seller's capital, is such a serious menace to the electrical business generally that it must be destroyed for the good of both the sellers and the contractor-dealers.

Much money and time are spent educating the contractor-dealer so that he will take his work at a profit-bearing price. Why should a seller extend credit to a contractor-dealer who has displayed persistence in taking work at a loss? Why should such practices, unfair alike to sellers and contractor-dealers, be tolerated? The answer to these questions suggests that an enlightened credit policy will do more than we at first suppose in building up a healthy business. And all those engaged in the business should be interested in the upbuilding which can be brought about by proper co-operation amongst jobbers and contractors in carrying out a credit policy which is both just and wise.

MANUFACTURE OF MAZDA LAMPS

The figures showing the manufacture of Mazda lamps are exceedingly interesting. In 1914 the manufacture of Mazda lamps was 74,000,000; in 1915, 99,000,000; in 1916, 121,000,000; and for 1917 it will run close to 138,000,000. There is an increase under war conditions of 70 per cent. The increase has been brought about without an increase in price to the ultimate consumer.

NOTES ON THE NEW CONSTITUTION OF THE N. A. E. C. AND D.

(W. L. Goodwin, in his efforts to upbuild a more helpful and effective organization among electrical contractor-dealers, will ever meet with encouragement from his many friends in the West, where he originally inaugurated his present plan that is now receiving national recognition. To those who have not had full opportunity to study the new constitution of the National Association of Electrical Contractors and Dealers, which embodies the salient features of the so-called Goodwin Plan, the following concise statement by W. Creighton Peet, chairman of the association, will be of interest.—The Editor.)

Transfer of National Association Affairs

The new National Constitution was put into effect officially on January 22, 1918, at St. Louis, Mo., when President Stearnes, representing the old form of organization (N. E. C. A.), formally turned over to the National Chairman, representing the new form of organization (National Association of Electrical Contractors and Dealers), the affairs and funds of the N. E. C. A. The transfer did not abolish the old organization. It changed its name and form of government, but did not affect the status of members in good standing at that time.

Form of Organization

Each organization, viz., National, Division, State, District, and Section, is controlled by a Chairman and Executive Committee.

The National is divided into three Divisions for organization purposes and to provide meetings more accessible to a greater number.

The Divisions, known as the Atlantic, Central and Pacific, are controlled and supported by the National.

The State Association is under the general direction of the Division. The State controls the National membership of the State, but in membership and financial matters deals direct with the National Secretary. It controls the District Associations.

Districts are of two kinds, Undivided and Divided, as may be decided by the members there located.

An Undivided District is one covering a smaller community where all members can conveniently hold monthly meetings. The District officers and Executive Committee are elected at District meetings.

In larger Districts where business conditions require it a District may be divided into Sections. The Divided District is governed by an Executive Committee, consisting of one member from each Section, and this Executive Committee elects the District officers.

It is intended that there will eventually be provided in all sub-divisions of the National, official secretaries through whom the educational and other work of the National will be carried out, thus:

1. From the National to the Division Secretaries.
2. From the Division Secretaries to the State Secretaries within the Division.
3. From the State Secretaries to the District Secretaries within the State.
4. From the District Secretaries to the Section Secretaries in a Divided District.

Membership

National membership must come through the District and State Associations and in a Divided District through the Section of the District.

Application blanks will be provided by the National Secretary and will contain on the reverse side the classification blank.

Both blanks must be completely filled and must be accompanied by the membership fees (unless waived) and by the current quarter's dues of the District, State and National Associations.

Said application shall first be presented to the District Secretary (or to the Section Secretary in a Divided District).

If elected by the District or by the Section of a District the application with certificate of membership attached shall be forwarded to the State Secretary.

When approved by the State Executive Committee, the applicant becomes a member of the State Association and upon notification from the State Secretary to the National Secretary he also becomes a member of the National.

In states not yet organized and pending such organization, applications shall be sent to the Secretary of the Division.

In Districts not yet organized and pending such organization, applications shall be sent to the State Secretary.

Members whose dues were paid on or before January 22, 1918, remain in good standing until June 1, 1918 (the expiration of the former fiscal year), and their dues under the new plan will begin at that date.

Members in arrears on January 22, 1918, thereupon automatically ceased to be members of the National Association and must make application as new members.

All members must be classified annually. Blanks for this purpose will be issued annually by the National Secretary direct to the member. This blank must be filled in and signed within two weeks, and returned.

Dues of the National, State and District are payable quarterly in advance upon receipt of invoice from District or Section Secretary, to whom remittance should be made.

Dues of members are based on their gross sales, and dues of associate members are based on their gross sales in the electrical or retail department of their business.

Eligibility of Membership

Any person, firm or corporation doing electrical construction or repairs, or selling electrical supplies, merchandise, appliances, fixtures or apparatus at retail is eligible to membership in the National Association of Electrical Contractors and Dealers.

This definition would include manufacturers, central stations, jobbers, contractors, dealers, electric fixture manufacturers, department stores, hardware stores, etc., etc., who sell direct to the consumer.

The above are eligible as "members" if such contracting and retailing form the principal part of their business, and are eligible as "associate members" if such retailing forms a department or minor part of their business.

ARTICLE II

The objects for which this Association is formed are:

To promote the welfare of its members.

To distribute among them the fullest information obtainable in regard to all matters affecting the electrical contracting and retail electrical merchandising business.

To issue engineering and data sheets required in electrical engineering and electrical contracting problems.

To collect data relating to the business of electrical contracting and retail merchandising.

To aid in bringing about more friendly relations between electrical contractors and electrical retail dealers and others engaged in the electrical industry.

To assist in marketing high grade electrical material and apparatus of American manufacture.

To encourage its members in establishing and conducting attractive retail electrical stores.

To elevate the standard of electrical installations.

To co-operate with State Boards of Underwriters and State and Municipal Inspection Departments, Engineers, Architects, Jobbers, Public Utility Companies, Municipal Electric Light and Power Companies and State and Local Electrical Credit Associations to generally improve business conditions.

To collect and diffuse information affecting merchants, manufacturers, builders and others engaged in erecting buildings.

Technical Hints

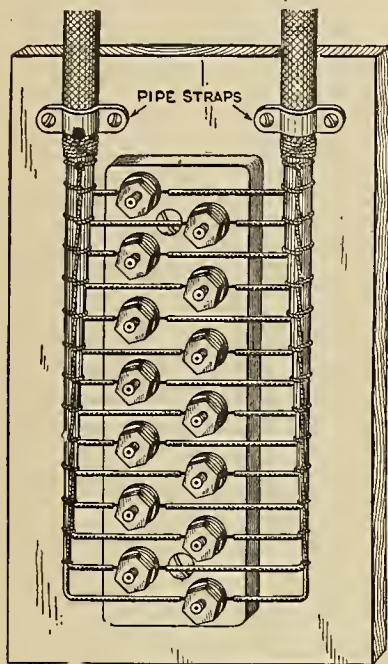
DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(The connections in cable systems, either at the terminal blocks or apparatus to which cable is connected, are very likely to be the weakest link in the installation unless they are properly made. The instructions given here are right up to the minute, and represent the very latest and approved practice. The author, who is a Western man, is now head of the Western Electric office in Buffalo, and in touch with practical problems as they are met in actual practice.—The Editor.)

INSTALLATION OF CABLES FOR INTERIOR TELEPHONE SYSTEMS

Terminal and Connecting Blocks

The simplest form of connecting block is shown in Fig. 1. This block consists of a number of terminal



Connecting block with staggered terminal posts—Fig. 1

posts imbedded in a hard composition base, the posts being staggered to facilitate connections. These blocks should be mounted upon a board, as shown in Fig. 1, with sufficient room left for fastening the cables to the board. Connecting blocks of this type are not furnished with a protecting cover. It is therefore advisable, when possible, to use the larger and more complete cable terminals. These are made completely of wood suitably shellacked to prevent absorption of moisture and have a base with sufficient space for supporting the cables and have a japanned sheet metal cover. The terminals are numbered for convenience in making connections or tests of the system. Each terminal post of the terminal blocks or connecting blocks is equipped with a number of washers. When connecting more than one wire to a post, these washers should be used to separate the conductors and prevent the wires from cutting each other. For this reason avoid twisting together a number of wires for connection to one terminal post. Further, the wires should always be wrapped about the posts in a right-hand direction so they will tend to tighten instead of loosen as the nuts are tightened.

Preparing the Cable for Connections

The cable should be lined up parallel with the board on which the terminals are mounted, allowing a length of 4 to 6 inches of cable to extend beyond the last terminal. Mark the cable at a point about $1\frac{1}{2}$ to 2 inches back of the first terminal. From this mark to the end remove the cable covering.

If the cable has a lead sheath, the latter can be removed by first making a very slight cut around the

cable as shown in Fig. 2, about one-third through the lead. The lead sheath can then be broken off at this point by bending it backward and forward, as in Fig. 3, after which it can be easily pulled free of the cable, as in Fig. 4. In cold weather or if the cable has been bent or twisted the sheath may not come off easily.



Removal of lead sheath—a cut one-third through the covering—Fig. 2

In that case, heat the end to be pulled off with a candle. This will soften the wax inside the cable and allow the lead sheath to be removed without danger of injuring the insulation or conductors.

If the cable has a braided covering, instead of a lead sheath, the covering can be removed by making a slit, by means of a sharp knife, lengthwise from the marked point on the cable to the end. In making this cut care should be taken to avoid cutting the insula-



By bending the cable back and forth at the break, the sheath is easily broken—Fig. 3

tions of the conductors. After this cut has been made, the braiding can be peeled off and removed with a pair of cutters. A wrapping of lacing twine should then be made around the cable where the braiding ends to prevent any further loosening of the covering and insulation at that point.

After the covering has been removed from the cable, the wires should be formed, fanned out and sewed up so that they will have the proper shape for connecting to the terminals. This is best accomplished by means of a small wooden board, Fig. 5. The marking of the board depends entirely upon the location



After it is broken, the sheath can be removed by simply pulling free of the cable—Fig. 4

of the terminals to which the wires are to be connected. The method of using this board and forming the wires for a cable of any size will be understood from the following instructions which apply to a cable arranged for connecting to a 28 post terminal block:

Mark the board, as in Fig. 5, each outside X mark being made at a point where a wire is to be brought to

a terminal, and a center X mark in the line between them. The vertical distance between the X marks will be the same as between the terminals of the apparatus. The horizontal distance between the outside X marks will be determined by the size of the block on which the terminals are mounted. Small nails are then driven in the X marks and the end of the cable laid out flat on the board against these nails. The wires are then brought out from the cable in the order in which they should run to the terminals and twisted around the center nails as in Fig. 6. Lacing twine should then be stitched around the cable to hold the wires permanently in position. The proper stitch to use is shown in Fig. 7.

Another method to secure the same results consists of drilling small holes, about $\frac{1}{8}$ inch in diameter, through the board at the outside X marks and pushing the proper wires through these holes and then stitching the cable with lacing twine as already explained.

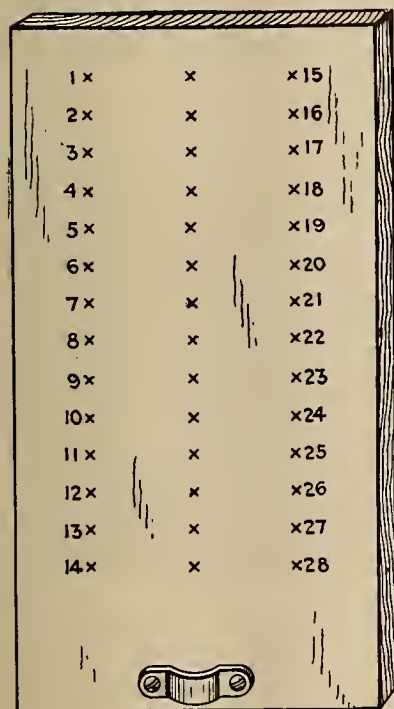
The conductors should then be cut off at a point about 1 inch beyond that required to reach the terminals when the cable is in its final position. The in-

insulation has been removed, the cable should be taken off the forming board and connected to the terminals.

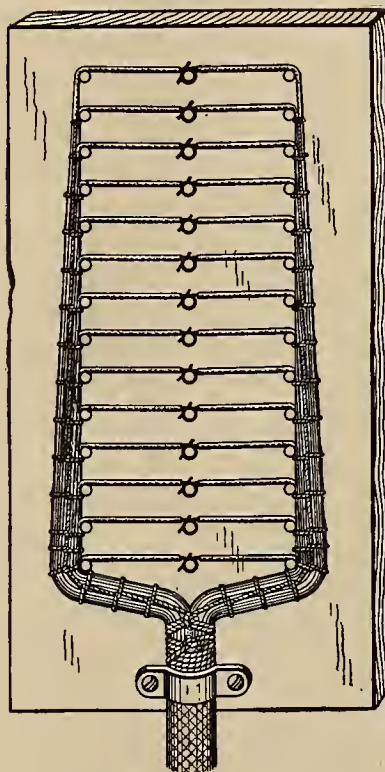
It is advisable to shellac the formed portion of the cable with a transparent shellac, which will prevent the insulation from fraying. Care should be taken to remove any piece of wire which may have fallen in among the terminals while wiring. This is often a source of trouble if not done. Every screw and lock-nut should also be examined to insure tight and positive connections.

Battery Connections

In laying out the cable system it should be noted that it is customary to connect the batteries required for the installation by means of wires separate from



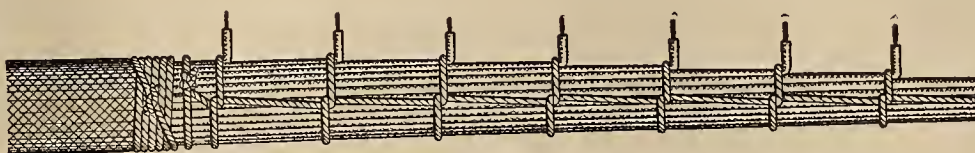
Board used for convenience in fanning out and sewing up cables so they will have the proper shape for connecting to the terminals. Small nails are driven in the X marks or small holes bored for the proper wires.



The final shape of the cable ends. The wires are brought out from the cable in the order in which they should run and twisted around the center nails.

sulation of each wire should then be removed to about 1 inch from the end. This is usually done by squeezing the insulation with a pair of flat-nose pliers. If sufficient pressure is applied, the insulation can then be easily removed. A knife should not be used for cutting the insulation. A knife may nick the wire, later resulting in a break and causing trouble. After the

the cable. The number of wires will depend upon the number of sets of batteries required. Some telephone systems require only one set of batteries, which supply both talking and ringing current. Others require a separate talking and ringing battery, but in any case not more than four wires are required. For this reason cable is not often used for this purpose, but of course there is no objection in doing so. It should further be noted that an extra set of batteries is usually required when door openers are to be used in conjunction with the system. The connections from the battery to the system of conductors is made at one terminal box, whichever is most convenient.



The proper stitch to be used in lacing the wires permanently in position

AGENCIES IN ELECTRICAL CO-OPERATIVE MOVEMENT

(The co-operative movement in the electrical industry has perhaps its strongest foothold in the West. The California Electrical Co-operative Campaign represents a broad stand for united effort between central station, jobber, manufacturer and contractor-dealer. The various leagues and local societies of the West, as represented here by one or two instances are also mediums for spreading co-operative feeling. But perhaps the most interesting of recent events is in the home-coming of W. L. Goodwin, who undoubtedly more than any other one figure, has stood for co-operation, and who now returns from the successful organization of the industry in the East to take part in the coming co-operative convention.—The Editor.)

BILL GOODWIN AND THE GOODWIN PLAN

BY W. D. KOHLWEY

When our friend, W. L. Goodwin, left us a little over a year ago, the California State Association of Electrical Contractors and Dealers—in fact, all kindred organizations over this Pacific Coast—suffered a very distinct loss and one that has been very much felt. His strength and force were still much needed to secure a solid foundation for our work.



W. L. GOODWIN

He is coming home and will be with us at Del Monte, and will show us how to prepare a firmer foundation upon which we can build solidly the association which will be a monument in the industry. Mr. Goodwin has been hard at work night and day, his every effort has been constructive organization for the industry at large; his work in the East was launched through the N. E. C. A., and the platform upon which it was adopted at New Orleans passed the censorship of the entire national organization without the change of a single word, which in itself speaks volumes. Rapid strides have been made since October, and but few states are outside of the national fold. California, the state of real progressive work, and the mother of real association work, is still outside of this fold; but I hope it will be only until the Del Monte meeting. Matters of great importance as regards the financing of the present California Electrical Co-operative Campaign have kept us out until now, but means to our joining the national movement at this time have been found, and everything points to a happy solution.

Let us all give Mr. Goodwin a joyous welcome; he has done more for the industry than any other one man—has spent 24 hours of many days on our problem, and therefore let us all show him our appreciation by answering the roll call at Del Monte.

NATIONALIZATION OF CONTRACTOR-DEALER ORGANIZATION EFFORT

BY M. A. DE LEW

The general trend upon the part of all branches of the electrical industry is to place it on a firmer business basis. The method now under way to accomplish this purpose by the electrical contractor-dealers has taken shape in plans to form a simple but complete organization throughout the entire United States, its territories and the Dominion of Canada.

It must be quite evident to all concerned that without an organization which will bind all branches

of the industry together, any unity of purpose is impossible.

The work undertaken proposes the organization not only of contractors and dealers, but co-ordination of effort with the jobbers and manufacturers to the end that uniform and equitable business policies may be established and maintained.

The central station forms also an important integral part of the scheme. In some portions of the country these organizations have been hitherto "playing it alone," as it were, with more or less primitive conception of the part that co-operation plays in business success. In some sections of the country, through the medium of public service commissions and combined co-operative effort, the general situation has shown marked improvement, but there are other sections where the central stations have not taken advantage of the opportunity to improve general business by co-operating with the contractor-dealer.

The purpose of the organization proposed is to place business on a sound basis throughout all branches of the industry, believing that in this way alone, can real gains be made by any of the individual units.

In short, the aim is to inject common sense business principles into all branches of the electrical industry. On the latter statement, there is no doubt in the writer's mind that he at once steps into an argument—to anticipate which he admits that it is his belief that very little common sense has been displayed in any branch of the electrical industry, except a little of very recent birth.

In the light of the above, which to the writer's mind, will be questioned only by men in the lower steps of the business from their own selfish interests, a tremendous virgin field lies before the pioneers in this movement toward organization. The question, of course, remains—are these various fields worthy of the effort? Can these fields be brought to that standard of excellent necessary to have and hold their just place in the commercial world? The writer believes that the answer is "Yes."

THE RISE OF LOCAL ELECTRICAL LEAGUES

Guided by the ablest men in the electrical industry in the West, the past year has seen a remarkable revival of the usefulness of local organizations among men of the industry in the forwarding of matters electrical.

The strenuous call upon the time of men of the electrical industry in their efforts to meet the emergencies of the day is making itself felt in the attendance of all organizations up and down the Pacific Coast. Practically every organization in civic life is feeling this same crisis.

There never was a time in the history of the industry when men had greater need for a forum for

the interchange of ideas, and yet the many diverse activities in which the necessities of the hour force them to engage forbid the keeping of many former organization engagements. So serious has this become in various localities of the West that consideration is being given to abandoning several of the organizations of a more or less conflicting nature and merging them into one all-absorbing society.

What is principally needed in all cases is an open forum, properly financed, where men may meet and have an opportunity to express views on important questions of the day, especially such questions as are found perplexing in the daily routine of present day emergency work. Such programs as may be planned should have very decided characteristics, and in order to bind the organized effort to the industry it serves the underlying motive should at all times be for the development of a wider and more helpful use of electrical energy in meeting present day problems, remembering at all times the war necessities of the hour.

In Southern California the Los Angeles Jovian Electric League is a splendid type of wide-awake activity. Under H. N. Sessions, commercial engineer for the Southern California Edison Company, this organization has forged ahead during the past season and today is a bond among men of the industry that is proving itself well worth while. The fraternalism of its membership, under lively entertainment and get-together features, has been developed to a very high state of helpfulness.



H. N. Sessions, president Los Angeles Jovian Electric League

As instances of successful meetings that have been held during the past year which may serve other localities for suggestions, the following are sample programs that have proved remarkably helpful and well-attended at the San Francisco Electrical Development League:



R. E. Fisher, president San Francisco Electrical Development League

1. "Old Timers' Day." Held just prior to Thanksgiving Day. Members over sixty years old who had seen twenty-five years or more of service in the industry, invited as guests of honor.

2. "Railroad Commission Day." Entire Railroad Commission of California, including its chief electrical engineer, invited as guests of honor to discuss vital problems of present day need.

3. "Ladies' Day." Distinguished ladies from college, Y. W. C. A., Food Control and other present day activities as guests. Meeting devoted to present day problems of women in their relation to the industry.

4. Civil Engineers' Day. Distinguished civil engineers from university faculties and professional life invited to tell of problems of closer relationship with electrical industry.

5. "Architects' Day." A most helpful gathering of architects in which many vital points of mutual betterment were brought out.

6. "Daylight Saving and Other Public Necessity Problems." Meeting addressed by Samuel Insull, president of the Commonwealth Edison Company of Chicago, in which men of the industry were led to see new light on perplexing problems of present day interest.

7. "Foreign Commerce Day." Meeting devoted to discussion of increasing friendly commercial and engineering relations with countries bordering the Pacific. Japanese, Chinese and American consuls invited as guests. Electricity's future part in Oriental relations especially emphasized.

THE CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

The California Electrical Co-operative Campaign, which has been approved and contributed to by the contractor-dealers, jobbers, manufacturers and central stations of California, to the extent of \$12,000, is now well under way. Detailed accounts of this helpful movement were given in the Journal of Electricity for January 15, 1918, page 84, and April 1, 1918, page 326. The campaign is carried on under the direction of an advisory committee composed of some of the ablest and best known men in the commercial side of the industry in the West.

Two field agents have been appointed to act under the direction of the advisory committee—A. L. Spring for the Southern and W. F. Brainerd for the Northern section of the state. Both of these young men have had years of practical experience in the California field, and it is believed that effective results are bound to follow the earnest effort they are now giving to the work.



A. L. SPRING



W. F. BRAINERD

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(In case another man obtains a patent on the device you have invented, it is still possible for you to file your claims, and if your inventive act is actually prior to his, to obtain your patent. An extremely clear and comprehensive statement of the elements involved in an "interference" proceeding, and a word of caution which should be carefully followed by inventors, go to make this article one of particular value and interest. The authors are members of the firm of White & Prost, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON PATENT LAW

Interference Proceeding

If one A files an application for a patent and, in such application, discloses an invention which is also disclosed in an application previously filed by one B and upon which no patent has been issued to B, the Patent Office may declare an "interference" between such pending applications of A and B for the purpose of ascertaining whether A or B was the first inventor and, therefore, entitled to the patent for such invention.

Also, if one A files an application disclosing and claiming an invention which is also covered by a patent issued to one B within two years prior to the date on which A's application was filed, the Patent Office may declare an interference between A's application and B's patent, for the purpose of ascertaining whether A was the first inventor and, therefore, entitled to the patent.

Patent Office Rule 93 reads as follows:

"An interference is a proceeding instituted for the purpose of determining the question of priority of invention between two or more parties claiming substantially the same patentable invention. * * The fact that one of the parties has already obtained a patent will not prevent an interference, for, although the Commissioner has no power to cancel a patent, he may grant another patent for the same invention, to a person who proves to be the prior inventor."

If, in an interference between A's application and B's patent, it is decided A was the first inventor, a patent is issued to A, who then can bring suit against B, in some United States District Court, and in such suit obtain a judgment canceling B's patent on the ground B was not the first inventor and, therefore, was not entitled to the issuance of such patent to him.

When an interference is declared, each of the parties thereto is required to file a "preliminary statement," under oath, showing the following facts:

- (a) The date of conception of the invention involved in the interference.
- (b) The date upon which was made the first drawing disclosing the invention, and the date upon which was made the first written description of the invention.
- (c) The date upon which the invention was first disclosed to others.
- (d) The date upon which the invention was "reduced to practice," that is, embodied in a practical machine, or if a process, practically used.
- (e) A statement showing the extent of use of the invention.

These preliminary statements must be carefully prepared, as the parties are strictly held, in their proofs, to the dates set up therein. If a party prove any date

earlier than alleged in his preliminary statement, such proof is held to establish the date alleged and no other.

After the filing of the preliminary statements, times are fixed by the Patent Office within which the parties must put in their proofs to substantiate the facts set forth in their respective preliminary statements. These proofs usually consist of oral testimony taken before a notary public at the place where the party and witnesses reside. Such oral testimony of witnesses is usually corroborated by documentary evidence and by models and machines concerning which the testimony is given. The opposing party is usually represented at the taking of such testimony by his attorney, who may cross-examine the witnesses.

In determining whether A or B should be adjudged the first inventor of the invention for which each of them seeks a patent, the following facts are deemed of controlling importance, to wit:

1. Date of "conception" of the invention.

Note.—As the "conception" of an invention is a mental operation, the proof thereof usually can be made only by proving a disclosure of such conception to others by means of an oral or written description of the "inventive idea of means," and, therefore, such date of disclosure to others is, practically speaking, the date on which the inventor must usually rely as his date of conception.

2. "Reduction to practice" of the invention by embodying it in a practically operative machine or art.

3. The "diligence" with which the inventor reduces to practice his invention, after mentally conceiving it.

If A conceived the invention and first reduced it to practice, he would be adjudged the first inventor without regard to his diligence in so reducing it to practice.

If A first conceived the invention but was later than B, in reducing it to practice, A would still be adjudged the first inventor, if he could show that he was, at all times, diligently at work in attempting to reduce his invention to practice.

If A conceived the invention after B's date of conception thereof, but A first reduced it to practice and B could not prove himself to have been diligent in attempting to reduce the invention to practice, A would be adjudged the first inventor and entitled to the patent.

As any inventor, in order to protect his invention and patent therefor, may be called on to prove the various facts referred to in such a preliminary statement, our advice to all inventors is:

1. Date all sketches and drawings, disclosing your invention, at the time they are made by or for you.
2. Preserve and keep all such sketches and drawings, as you may need them as proof, years after your patent is issued.
3. When you exhibit such a sketch or drawing to another person, before filing your application, have such per-

son sign his name thereon, together with the date on which the drawing is shown to him.

4. Preserve and keep all bills and other documents showing the respective dates on which materials were bought for and work done in respect to the construction of your first models and machine embodying your invention.

5. Preserve and keep the first models embodying your invention.

6. When you exhibit such a model to another person, before filing your application, have such person sign his name thereon together with the date of such exhibition thereof to him.

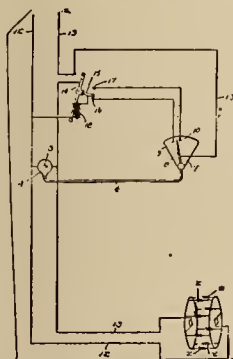
7. Preserve and keep all documentary evidence, etc., which can be used to prove any of the facts referred to in such a preliminary statement.

As the filing of an application is deemed a "constructive reduction to practice," it is important for an inventor to file his application as soon as he can after perfecting his invention.

WESTERN INVENTIONS

Temperature Control System

Patent No. 1,256,969, issued to Frank Ahlburg, of San Francisco, California, and assigned to the Electric Fruit Marking Co., of San Francisco, discloses a novel and meritorious electric system for controlling the temperatures of electric heating elements. An object of the invention is to provide a system for controlling the temperature or maintaining a substantially constant temperature in one or a plurality of electric heating units. The system is particularly adapted to control the temperature of electrically heated

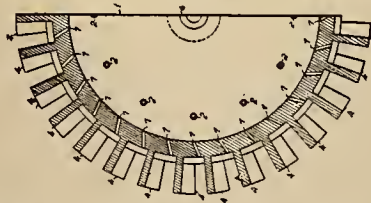


irons, electrically heated ovens, electrically heated printing dies, or other electrically heated devices. The patent shows the system as applied to a plurality of heating units arranged in parallel, the temperature of which is maintained substantially constant. Connected in the power circuit out of thermal contact with the heating elements, is a master heating element, the temperature of which varies with the temperature of the heating elements to be controlled. Associated with the master heating element is a thermostat which is connected to a solenoid operated switch, which opens and closes the power circuit when the previously determined maximum and minimum temperatures are reached. The thermostat is adjustable to cause the switch to operate for variations in a few degrees of temperature, so that the temperature of the plurality of heating elements is maintained substantially constant.

Gas Turbine

Patent No. 1,255,924, issued to Willis D. A. Peaslee of Corvallis, Oregon, discloses an ingenious form of gas turbine. It is well known that the principal difficulty encountered in the operation of a gas turbine is the extremely high temperature which obtains within the turbine, causing the blades to bend and warp, and in some instances to melt. Many efforts have been made to solve this difficulty, and one method is proposed in this patent. In this construction, the

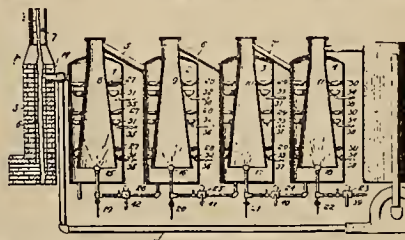
hollow turbine rotor is provided with apertures opening behind the blades. Water is fed into the rotor and out through the



apertures against the back of the blades, thereby keeping them comparatively cool.

Apparatus for Testing Petroleum

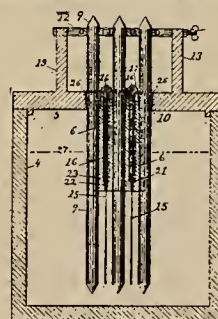
Patent No. 1,257,199, issued to Roy C. Dundas of Los Angeles, California, describes a method of treating petroleum and an apparatus for carrying out the process. The apparatus consists of a plurality of chambers, in each of which is sus-



pending a vaporizing flue, which is spaced from the side walls of the chamber. Hot gases are introduced into the top of the first chamber, whence they pass down around the flue and then up through the flue into the next chamber, where their movement is repeated. Petroleum is sprayed into the bottom of each flue and the spray is carried by the hot gas stream.

Electrolytic Cell

Patent No. 1,256,319, issued to Thomas C. Hitt of Seattle, Washington, shows an electrolytic cell in which the anodes are partly enclosed in boxes which are partly sub-



merged in the electrolyte. The anodes depend from the boxes and the feed wires are connected to the anodes within the boxes, being thereby sealed against electrolytic action.

High Tension Suspension Insulator

Patent No. 1,256,643, issued to Svend Barford of Oakland, California, discloses a novel form of suspension insulator for high tension conductors. The insulator consists of a metallic cylinder open at both ends, having a disc



shaped insulator arranged therein at the center, so that the cylinder protects the insulator from rain and snow. Extending through the cylinder and the insulator and secured to the insulator is a beam, the ends of which project beyond the ends of the cylinder.

SPARKS—Current Facts, Figures and Fancy

(In Spain you take your electric fixtures and all your wiring arrangements along with you when you move. In China your house will probably be better outfitted, with the modern tendency toward electrification. Mexico reports increased fares for tramway systems in response to high costs of materials. In this country war gardens and aeroplanes occupy prominent places in the public's interest, as noted below.—The Editor.)

The latest is the door-bell fire alarm. An inexpensive electric fire alarm has been made that may be attached to any electric door-bell. When the fire starts and raises the room temperature above a certain degree, the door-bell will ring until it is shut off.

* * *

A central station "trouble" man in one of our Western cities was recently called upon to remedy a short circuit in a floor plug. He found that a member of the household had concealed \$30 in gold in this convenient hiding place. With this removed (and returned to the owner) the trouble was remedied.

* * *

China is well on the way to electrification with her electric bells, telephones, lights, motors, to say nothing of native electrical fitters and hundreds of Chinese shops that deal in electrical devices. In Peking, alone, there is a school for the training of wireless operators and there are many native telegraph operators.

* * *

That the tendency to increase fares along with the high cost of living is not confined to this country is to be seen in the recent report from Mexico that the "Secretary of Communications" has authorized the management of the Mexican tramway company to raise the fares on its city lines from 6 to 10 cents.

* * *

At best the life of an aeroplane is but two months and the engine must be overhauled after seventy-five hours. To supply the needs of our forces in France, this means that we should supply something like five thousand planes a month. No wonder that cedar telegraph poles are scarce and our lumber men are cutting spruce for airplane parts!

* * *

Just to point out how much improvement is possible in the speeding up of processes with which we have been quite satisfied—photographers with the aviation observation corps in France must develop plates, print the pictures and place the finished product in the hands of the intelligence officer in about ten minutes after the films are received from the airplane.

* * *

Some combination companies supplying both gas and electric service are now recognizing their ability to economize on billing and mailing expense through joint bills for both services. The saving is, of course, apparent, and its effect on collections and on book-keeping are to be considered. The customer receiving one bill instead of two at different times is not faced with the annoyance of the double service. Besides, with one customer account the necessity of going over his account twice is eliminated.

Although we have come to think of the landscape poster as almost an American institution, when you think of it, the name itself is more akin to the European method of round street posts for advertising. Indeed, they are said to have originated in London, where in former times the footways of London were separated from the drives by a line of posts, on which advertisements were displayed.

* * *

The right of way along railway tracks, whether transcontinental or electric suburban, comprises much ground which is adaptable for planting to war gardens. The Southern Pacific Company is not only planting gardens itself in connection with section houses, and through encouraging employees to raise vegetables on company land, but it is leasing any such available property to outsiders who wish to start war gardens.

* * *

It is the usual custom in Spain for householders and apartment dwellers to install their own electric lighting wires and arrangements, carrying away with them when they move all these fixtures as well as bulbs and lamps. In the interior of buildings, the light wires are usually visible in consequence. As the Spaniards are generally fond of light the illumination is frequently brilliant and the light fixtures correspondingly elaborate.

* * *

Some people think that machine milking hurts cows and tends to dry up the milk, but this impression is not borne out by the facts in the case, say the University of California dairy experts. "Interested Jap's Santa," the cow which holds the Jersey State record for butterfat production for one year, was milked with a milking machine during the lactation period previous to the last one and produced 9052 pounds of milk and 587.95 pounds of butterfat during the period.

* * *

To the electrical men who are tending war gardens the aphid is a familiar pest, but his doom is written. One of the most peculiar harvests in the world takes place in the foothills of Nevada and Placer counties during February and March. At that time the state of California, through its Insectary Department, harvests from 60,000,000,000 to 75,000,000,000 lady bugs. These bugs are gathered in cases, each holding about a quart or 33,000, and sent to Sacramento, where they are stored until the summer season, when they are sent into the different sections of the state to feed on the aphid which attacks the cantaloupes, beans and various other vegetables.

PERSONALS

John D. Ryan, of the Montana Power Company, with headquarters at Butte, Mont., has been appointed by the Secretary of War as chief of aircraft production. In the reorganization of the signal corps, the aviation section is virtually divorced from the corps proper. The actual production of aircraft is turned over to Mr. Ryan. Brigadier-General William L. Kenly is made chief of a new division of military aeronautics, to control training of aviators and military use of aircraft. The West rejoices in the appointment of Mr. Ryan to the new high service. He



has long been regarded as one of the West's foremost builders and his great part in the electrification of the Chicago, Milwaukee & Puget Sound Railroad, the first to pierce electrically the great passes of the Rocky Mountains, will be a lasting monument to his name.

L. O. Kennedy, general superintendent of the Denver Gas & Electric Company, was recently elected a member of the A. I. E. E.

A. A. Miller, manager of the railway and power division, Westinghouse Electric and Manufacturing Company, Seattle, is in Pittsburgh in connection with company business.

Captain Gordon H. McCoy, formerly connected with the sales department of the Utah Power & Light Company, is now connected with the Field Artillery, School of Fire, at Fort Sill, Okla.

Major-General E. G. Swinton, the inventor of the British tank, accompanied by Frank Odell, personal representative of Secretary of the Treasury McAdoo, was a recent San Francisco visitor.

Lieut. Harold Flager, formerly with the engineering staff of the Puget Sound Traction, Light & Power Company, has been transferred from the officers' training camp, Camp Lee, to Camp Wheeler, Ga.

W. B. Vestal, Jr., has resigned as city engineer of Anaconda, Mont., to accept a position with a manufacturing concern in Spokane, Wash. M. E. Kelly, heretofore assistant city engineer, succeeds Mr. Vestal.

E. E. Hickock, city engineer of Alameda, Cal., has received orders to report to an Eastern camp as captain in the Reserve Engineers. During his absence Assistant City Engineer Burnett Hamilton will have charge of the office.

Charles E. Wells was recently re-elected to the presidency of the Oregon Local Telephone Association. All of the old officials were reinstated with the exception of the secretary, Charles E. Button, who has moved to Lindsay, Cal., to take charge of the telephone system there.

John L. Vaughan, pioneer electrical contractor and dealer of Oregon, is also acting mayor of Pendleton. He is a great believer in rigid inspection and regulation in the installation of electrical construction, and has done much to make Pendleton the leading town in Eastern Washington electrically.

William W. Boulton, mechanical engineer, has moved his office from the Lyon Building to 611 Pacific Building, Seattle. Mr. Boulton has been a resident of Seattle for the last fifteen months, coming from St. Louis, and reports work in his line very active. He specializes on machine designing, patent drawings, etc.

George C. Quinan of Seattle, chief engineer of the Puget Sound Traction, Light & Power Company, will attend the war

service engineering sessions of the Del Monte convention. As engineering representative of the Northwest Electric Light & Power Association, it is anticipated that his presence will prove unusually helpful in the discussions.

Elmer Dover, vice-president of H. M. Byllesby & Company, with headquarters at Tacoma, Wash., who is General Chairman of the Liberty Loan Committee for the Tacoma district, reports that his district went "over the top" without a bank subscription by noon Saturday, April 12th. Seventy-five per cent of the total was made up of subscriptions below the \$10,000 class.

John B. Fiskien, superintendent of light and power for the Washington Water Power Company, is a recent Portland visitor, where he addressed the local section of the American Institute of Electrical Engineers on "Changes in distribution system on account of range load." Mr. Fiskien has long been a prominent electrical engineer in the Northwest, and holds the office of manager in the American Institute.

O. A. Smith has been appointed general passenger agent of the Pacific Electric Railway, of Los Angeles, Cal., taking up part of the duties previously performed by **D. W. Pontius**, now general manager of the San Diego & Arizona Railroad. Mr. Smith was formerly assistant to Mr. Pontius in the passenger department. He became connected with the Pacific Electric Railway nine years ago, coming to that company from the Missouri, Kansas & Texas Railroad.

Walter Arnstein, president of the Oakland, Antioch & Eastern Railway, returned from a two weeks' trip to New York and Washington in time to attend the annual meeting of the company, at which he was re-elected to the presidency. One of the purposes of Arnstein's trip to the East was to take up with the railroad authorities the status of the Oakland, Antioch & Eastern under the Presidential order taking over the country's railroad systems by the government. Coincident with his return there was received a dispatch from Washington saying that the Senate had passed a bill authorizing the United States Shipping Board to commandeer electric lines connecting with shipbuilding yards in all parts of the country.

R. S. Blake, substation engineer of the Pacific Telephone & Telegraph Company, San Francisco; **Waldo C. Cole**, sales engineer with the Westinghouse Electric & Manufacturing Company, San Francisco; **S. W. Kephart**, electrical engineer, San Francisco; **H. S. Logan**, electrician of Butte, Mont.; **E. W. Moreland**, appraisal engineer with the Portland Railway, Light & Power Company; **H. J. Rathbun**, engineer with the Federal Telegraph Company, Palo Alto; **R. R. Robley**, operating engineer, Portland Railway, Light & Power Company; **O. H. Stevenson**, power plant operator, Pacific Power & Light Company, Naches, Wash.; and **J. F. Wiecks**, electrician with the Washington Water Power Company, Spokane, Wash., were recently elected to the A. I. E. E. as associate members.

A. W. Leonard, president of the Puget Sound Traction, Light & Power Company, of Seattle, Wash., and who is identified with the Soldiers' and Sailors' Club, has been placed in charge of training camp activities for the State of Washington. The appointment came through Pacific Coast Director Ellis of the Fosdick Commission with headquarters at San Francisco. He will have charge of co-ordinating the various training camp activities. His appointment came through the recommendation of the State Council of Defense. This is again another instance where utility men are playing such a vital part in the present war service activities of the nation.



George S. Nickerson, chief engineer of North Fork Irrigation Project, has been elected president of the Engineers' Club of Sacramento, Cal. Sacramento, surrounded as it is on all sides by great hydro-electric developments and intensive agricultural activity of California, combined with the technical talent that perforce centers at the state capital, has long been an important center for engineers of the West. The recognized executive ability of Mr. Nickerson augurs well for the future prosperity of the organization over which he will preside during the coming year.



William H. Burr, professor of civil engineering at Columbia University, is a San Francisco visitor.

J. F. Killeen, vice-president of Rathbone, Lord Electric Co., Inc., and wife, of Albany, N. Y., are Pacific Coast visitors and expect to attend the Del Monte convention.

H. H. Courtright of the Valley Electrical Supply Company at Fresno, Cal., has been an active figure in the Liberty Loan and Salvation Army Hut work in the San Joaquin Valley.

O. W. Lillard, Pacific Coast manager of the Gold Storage Battery Company, has recently left for the East, but hopes to be back in time to attend the Del Monte convention of the Pacific Coast Section, N. E. L. A.

E. C. Deal, general manager of the Trinidad (Colo.) Electric Transmission, Railway & Gas Company, has become general manager of the Springfield Gas & Electric and Springfield Traction Companies, Springfield, Mo.

F. E. Blake, general manager of the Hawaiian Electric Co., Ltd., and wife, of Honolulu, are spending several weeks in Pacific Coast cities. They will both attend the Pacific Coast convention, N. E. L. A., at Del Monte.

Joseph Thieben, general manager of the Panama Lamp & Commercial Company, San Francisco, Cal., is now making a trip through the East closing territorial rights for America and for export trade on the Panama-Lite fixture.

Lieut. Fred B. Hanchett of the U. S. Coast Artillery has been ordered to duty at Portland, Ore., and left Chicago on April 6th for that post. Lieut. Hanchett before entering the Army was associate editor of the Electrical Review.

Leonard Metcalf, consulting engineer of Boston, Mass., who has for several weeks past been testifying before the California Railroad Commission in behalf of the Spring Valley Water Company, has returned to his home in the East.

Frank J. Airy, Los Angeles manager of the Pacific States Electric Company, is back again in his home city after a recent visit to San Francisco, and is now preparing to attend the Del Monte convention of the Pacific Coast Section, N. E. L. A.

F. E. Newbery, president of the F. E. Newbery Company, with headquarters at St. Louis, is visiting the Coast on a tour of inspection of the Western offices of the company. He expects to attend the Del Monte convention, and will be in this vicinity about a month.

W. L. Goodwin, formerly vice-president of the Pacific States Electric Company of San Francisco, and now connected with the General Electric Company, with headquarters in New York City, is spending three weeks on the Pacific Coast and will attend the Del Monte convention of the Pacific Coast Section, N. E. L. A.

Jackson K. Fairchild, electrical engineer, and former cost expert for the Great Western Power Company, writes that he has arrived in England after an uneventful voyage, and finds the countryside beautiful and the weather fine. Mr. Fairchild is with the 371st Aero Squadron, recently in training at Mineola, Long Island, N. Y.

W. P. Southard, general manager of the Albuquerque (N. M.) Gas, Electric Light & Power Company, has been appointed general manager of the Trinidad (Colo.) Electric Transmission, Railway & Gas Company, to succeed E. C. Deal.

D. Lynn Plantz, who has been located at Montesano, Wash., as manager of the Northwest Electric & Water Company, with plants at Montesano and Elma, and one of Marshall & Company holdings, has left for Seattle to act as assistant treasurer of the Pacific States Electric Company at that point. C. P. Kinkaid of Stanwood, Wash., succeeds Mr. Plantz.

E. H. Emerson, electrical engineer for the Oriental Consolidated Mining Company of Unsankinko, Chosen, has left for his seat of engineering activity in the Orient aboard the Siberia Maru. Otto Peterson, formerly in charge of construction in the Lake Spaulding Development of the Pacific Gas & Electric Company, has gone with Mr. Emerson to take charge of his new work, as announced in the Journal of Electricity for April 1, 1918.

Charles Grunsky, formerly in the engineering staff of the California Railroad Commission, but during the past year commissioned as first lieutenant of the 5th U. S. Engineer Train, has recently been promoted to the rank of captain in the 5th U. S. Regulars (Engineer Corps). Mr. Grunsky has been stationed at Corpus Christi, Texas, and upon leaving his former command was presented with a gold watch and a letter of deep appreciation and hearty congratulation by the men formerly under his care.

W. B. Collins, district manager of Marshall & Company light and water plants in Southwest Washington, residing at Montesano, has left for Boston, where he will become manager of a group of plants for the company, and consulting engineer in connection with the purchase of new properties. Marshall & Company are primarily a bonding concern, though owning many groups of light and power plants throughout the country. F. D. Nims, of Seattle, northwestern manager for Marshall & Company properties, takes over also the duties of Mr. Collins.

Dr. W. W. Campbell, director of the Lick Observatory of the University of California, has been elected a foreign member of the Royal Society of London, considered to be a rare honor among scientists. The Royal Society numbers about 400 Ordinary Members, who are scientists of Great Britain. There are about 40 Foreign Members, chosen from the scientists in all countries. But four of the 40 are Americans. Among other helpful contributions to the electrical industry in the West by Dr. Campbell is the article of "Time Phenomena of Interest to Engineers," appearing in the columns of the Journal of Electricity for March 15, 1917.

Prof. L. J. Corbett, head of the Electrical Engineering Department of the University of Idaho, has received a commission as captain in the Engineer Reserve Corps, and has to report May 1st for duty at Camp Lee, Va. For the past seven years Professor Corbett has been at the head of the electrical engineering department of the University of Idaho, following a number of years of outside practice, the last five years of which were in consulting engineering work in Spokane, in hydraulic, irrigation and electrical lines. He is also a member of the board of examiners of architects of the state of Idaho.

C. H. Van Hooven, claim agent of the Manila Electric Railroad & Light Company, of Manila, P. I., who has been visiting the United States on a vacation for the purpose of consulting with officers of the J. G. White Management Corporation, of New York, the operating managers of the Manila Company, is returning to the Philippines by way of Hawaii and Japan. While in the United States, Mr. Van Hooven also devoted considerable time to inspecting the claim methods of electric railways in a number of large cities. He has been connected with the Manila Electric Railway & Light Company for the past ten years.

W. F. Humphrey, manufacturer of electrical goods, from Rochester, N. Y., was a recent San Francisco visitor.

T. R. Womeldorf of the Comet Electric Company of Eugene, Ore., won the blue ribbon for the best window display in a contest held in that city recently.

A. L. Martin, manager of the Oregon Power Company, Marshfield division, has been elected a member of the board of directors of the Marshfield Chamber of Commerce for the ensuing year.

F. E. McKenna, formerly superintendent of the Oregon Power Company at Coquille, has been transferred to Marshfield as general superintendent for the Coos Bay division of the Oregon Power Company.

George A. Ferguson, auditor of the Western States Gas & Electric Company, Richmond, Cal., division, has entered the government service under the draft, making six stars in the Richmond's division's service flag.

A. Z. Hadley, for a number of years connected with the Clearwater Telephone Lines, Orifino, Ida., is now a member of Company C of the 316th Field Battalion of the U. S. Signal Corps and is stationed at Camp Lewis, Tacoma, Wash.

C. C. Jacob, formerly district engineer in the United States Geological Survey at Salt Lake City, Utah, has been appointed federal water commissioner in the Uinta Basin, Utah. A. B. Purton, who was assistant engineer, succeeds him as district engineer.

J. D. Ross, superintendent of the city light department of Seattle, Wash., together with Glen Smith and W. T. Batcheller, of that department, Thomas Murphine, superintendent of public works, and Mayor Hanson, have returned to Seattle after a five day survey of the Skagit River power site.

Major John Coffee Hays, officer in charge of utilities at Camp Lewis, Wash., has been appointed construction quartermaster, succeeding Lieut.-Col. James Como, who hitherto has been both camp and construction quartermaster. Major Hays has had charge of the new construction under Col. Como.

C. M. Brewer, manager of the Richmond, Cal., division of the Western States Gas & Electric Company, has been appointed a member of a committee organized for the purpose of assisting the Industrial Commission in effecting a suitable building and loan plan to increase the residences in Richmond. Mr. Brewer has also been made a member of the executive board of a newly organized war body to be called "Community Council for War Work."

Frederick H. Fowler, engineer of the U. S. Forest Service in this district, told the engineers at a recent meeting of the San Francisco Chapter of the American Society of Civil Engineers some of the difficulties of the present water power situation and his hopes for their removal. As the rate-making bodies are now showing a disposition to grant what have been called emergency war rates, he pointed out that the way would be opened for necessary power development in this state.

T. E. Bibbins, president of the Pacific States Electric Company, who is the captain of Group 10, Class E, in the Third Liberty Loan Drive in San Francisco, has been personally commended for the excellent work of his team in the present drive. This team is the only one thus far honored in this manner. The following electrical men comprise the team: W. S. Berry, E. E. Browne, Chas. Felix Butte, P. Decker, M. A. DeLew, D. E. Harris, C. C. Hillis, R. D. Holabird, S. Ickelheimer, Louis Levy, M. L. Scobey, C. E. Wiggin.

OBITUARY

W. W. Cotton, counsel for the Pacific Power & Light Company, died recently at Los Angeles, Cal. Mr. Cotton was

well known in electrical circles and is greatly mourned by his many friends.

Announcement of the death of Joseph Kenter Smith is made by the Pittsburgh Piping and Equipment Company, of which organization he was vice-president.

Rufus Franklin Emery, aged 48, secretary and treasurer of the Westinghouse Airbrake Company, and an officer and director of several other important corporations, died suddenly on April 11th, having been stricken with heart failure while seated at his desk. Mr. Emery was assistant secretary of the American Brake Company, assistant secretary and a director of the National Brake and Electric Company, a director of the Vulcan Crucible Steel Company, secretary and treasurer and a director of the Westinghouse Friction Draft Gear Company, and treasurer and a director of the Westinghouse Traction Brake Company.

Augustine W. Wright died February 3d, in Los Angeles, Cal. Mr. Wright was consulting engineer in connection with the building of the first city railroad in New York, and in the early seventies he helped to design the cable railway established in Chicago by the late Charles T. Yerkes, and was chief engineer for this system for a number of years. In 1889 and 1890 Mr. Wright helped to build the first cable railway in Los Angeles. In his early twenties he had charge of much of the construction of the Union Pacific Railway across the plains of Kansas, Nebraska and Colorado. Later he was for five years chief engineer of the Northern Pacific Railway. Mr. Wright retired from active railroad work in 1890. He was 71 years of age.

THE LATEST ADVANCE INFORMATION ABOUT THE DEL MONTE CONVENTION



A relic of the time before the "Americanos" came to Monterey

ITHIN the past semi-monthly period affairs pertaining to the Del Monte Convention of the Pacific Coast Section, N. E. L. A., have been rapidly taking shape. From every quarter of the nation, including the Hawaiian Islands, men are now en route to attend its sessions. At 10:30 o'clock, Thursday morning, May 9th, at the Del Monte Hotel, Captain Jackson, president of the Pacific Coast Section, N. E. L. A., will open a distinguished war service gathering. From all quarters congratula-

tions are pouring in over the excellent war service papers that have been prepared by the Commercial Committee, R. M. Alvord, chairman, and the Engineering Committee, J. E. Woodbridge, chairman. These papers were published in full in the Journal of Electricity for April 1 and April 15, 1918. On page 383 of the April 15th issue full instructions were given concerning the convention program and the various sessions, with definite dates for their holding.

It has not seemed best to feature in the publicity notices the entertainment features of this convention, for great emphasis is desired upon its war service ideals. In passing, however, it is to be noted that never before in the history of Pacific Coast electrical gatherings has a more beautiful and

HEARTFELT APPRECIATION is hereby expressed to the many readers of the Journal of Electricity for the generous manner in which the subscription blanks sent out in the last issue are coming in from all sections of the West. There is no more effective way in which readers of the Journal of Electricity can aid in the upbuilding of the West than by becoming subscribers to the Journal of Electricity, and urging others to do so.

entertaining series of stunts, social gatherings and get-together features been planned than are in the making for this convention, for it is felt that this one great gathering of the year should be conducted not only to forward direct engineering and commercial war service, but closer social ties between men of the industry throughout the West means much for patriotic and service appeal during months yet to come.

Never before have so many advance reservations poured into the convention committee's hands looking toward attendance at the convention. At the time of this writing it is fully two weeks before the convention is to be held, and yet a splendid advance registration has been sent in. For information relative to train schedules, reservations on trains and at the Hotel Del Monte, inquiry should be sent to W. M. Deming, Master of Transportation, care Journal of Electricity, San Francisco, or to E. R. Northmore, Assistant Master of Transportation, care Los Angeles Gas & Electric Corporation, Los Angeles. For other information concerning convention details, address inquiry to Robert Sibley, general chairman, care Journal of Electricity, San Francisco.

There are many who have neglected to send in their names. All those who expect to attend the convention should send in their names at once to the Master of Transportation, in order that reservations may be made both on the trains and at the hotel. Advance registration is also necessary in order to receive mention in the first Service Issue of the Journal of Electricity, which will be distributed upon arrival of the guests at Del Monte.

Advance List of Registration

- Adams, Q. Westinghouse Electric & Manufacturing Co., San Francisco.
 Airey, F. and wife. Pacific States Electric Company, Los Angeles.
 Alexander, I. W. San Joaquin Light & Power Corporation, Fresno, Cal.
 Aller, H. S. Pacific Gas & Electric Company, Phoenix, Ariz.
 Alvord, R. M. General Electric Co., San Francisco.
 Ballard, R. H. and wife. Southern California Edison Company, Los Angeles.
 Balzari, R. A. Westinghouse Electric & Manufacturing Company, San Francisco.
 Barre, H. A. and wife. Southern California Edison Company, Los Angeles.
 Batchelder, H. S. Western States Gas & Electric Company, Stockton, Cal.
 Baurhyte, Wm. and wife. Los Angeles Gas & Electric Corporation, Los Angeles.
 Behan, R. F. Westinghouse Electric & Manufacturing Company, San Francisco.
 Bennett, T. J. Rex Electric Co., San Francisco.
 Bibbins, T. E. and wife. Pacific States Electric Company, San Francisco.
 Bibbins, Miss Arda, Berkeley, Cal.
 Black, J. B. and wife. Great Western Power Company.
 Blake, Frank E. and wife. The Hawaiian Electric Co., Ltd., Honolulu, T. H.
 Bliven, C. M. General Electric Co., Los Angeles.
 Bostwick, Henry and wife. Pacific Gas & Electric Company, San Francisco.
 Bowden, J. P. Edison Electric Appliance Co., San Francisco.
 Bowers, Nathan A. McGraw-Hill Pub. Co., San Francisco.
 Britton, John A. and wife. Pacific Gas & Electric Company, San Francisco.
 Brown, E. D. Reno Power, Light & Water Company, Reno, Nev.
 Burger, T. E. and wife. Baker-Joslyn Co., Los Angeles.
 Buswell, J. M. San Joaquin Light & Power Corporation, Fresno.
 Butte, C. F. and wife. Butte Engineering & Electric Company, San Francisco.
 Campbell, Geo. A. Reno Power, Light & Water Company, Reno, Nev.
 Carlson, Jos. M. and wife. Central Electric Company, San Francisco.
 Carpenter, A. B. San Joaquin Light & Power Corporation, Fresno.
 Casad, Raleigh. San Joaquin Light & Power Corporation, Merced.
 Case, J. O. General Electric Company, Los Angeles.
 Casper, Albert. Vallejo Light & Power Company, Vallejo, Cal.
 Cooper, A. S. The Southern Sierras Power Company, Riverside, Cal.
 Crawford, E. J. San Joaquin Light & Power Corporation, Fresno.
 Crawford, P. O. California-Oregon Power Co., San Francisco.
 Cridle, E. B. Southern Sierras Power Company, Riverside, Cal.
 DeLew, M. A. and wife. San Francisco.
 DeLew, Miss Bernice, San Francisco.
 Dellman, G. H. P. General Electric Company, Los Angeles.
 Deming, W. M. and wife. Journal of Electricity, San Francisco.
 Dolson, F. O. The Southern Sierras Power Company, Riverside, Cal.
 Dunbar, W. R. Westinghouse Electric & Manufacturing Company, San Francisco.
 Durfee, W. E. San Joaquin Light & Power Corporation, Fresno.
 Einhart, C. M. and wife. Roswell Gas & Electric Company, Roswell, N. M.
 Elliot, A. H. and wife. Secretary Pacific Coast Electric Supply Jobbers Association, San Francisco.
 Farrow, E. D. San Joaquin Light & Power Corporation, Fresno.
 Ferguson, P. R. Southern Sierras Power Company, Riverside, Cal.
 Fisher, R. E. and wife. Pacific Gas & Electric Company, San Francisco.
 Gibson, Mrs. Frank A. National Council of Defense, Los Angeles.
 Goddard, W. T. Locke Insulator Manufacturing Company, Rochester, N. Y.
 Grunsky, Clotilde. Journal of Electricity, San Francisco.
 Hall, C. B. Illinois Electric Company, Los Angeles.
 Halloran, A. H. and wife. Journal of Electricity, San Francisco.
 Harris, D. E. and wife. Pacific States Electric Company, San Francisco.
 Hartzell, H. F. Baker-Joslyn Co., San Francisco, Cal.
 Heise, Carl and wife. Westinghouse Electric & Manufacturing Company, San Francisco.
 Helfrich, L. C. Sierra and San Francisco Power Company, San Francisco.
 Herbert, C. D. Westinghouse Electric & Manufacturing Company, San Francisco.
 Hobrecht, J. C. J. C. Hobrecht Company, Sacramento, Cal.
 Holloway, A. E. and wife. San Diego Consolidated Gas & Electric Company, San Diego, Cal.
 Hopkins, H. C. Westinghouse Electric & Manufacturing Company, San Francisco.
 Hughes, Geo. A. and wife. Edison Electric Appliance Company, Chicago, Ill.
 Hunt, C. R. The Robbins & Myers Company, San Francisco, Cal.
 Husbands, R. H. and wife. Pacific States Electric Company, Los Angeles.
 Hutchinson, E. C. and wife. The Pelton Water Wheel Company, San Francisco.
 Hyatt, W. P. Sacramento, Cal.
 Ingalls, C. E. Crocker-Wheeler Company, San Francisco.
 Jackson, H. F. and wife. Sierra and San Francisco Power Company, San Francisco.
 Kahn, Samuel and wife. Western States Gas & Electric Company, Stockton, Cal.
 Kemp, A. N. and wife. Southern California Edison Company, Los Angeles.
 Kenny, C. B. NePage & McKenny, San Francisco.
 Klauber, L. M. and wife. San Diego Consolidated Gas & Electric Company, San Diego, Cal.
 Levy, L. and wife. Levy Electric Company, San Francisco.
 L'Hommedieu, Wm. P. Westinghouse Electric & Manufacturing Company, San Francisco.
 Lisberger, S. J. and wife. Pacific Gas & Electric Company, San Francisco.
 Lowe, Leon P. San Francisco.
 Mason, D. P. San Joaquin Light & Power Corporation, Fresno.
 McCardle, C. M. San Joaquin Light & Power Corporation, Dinuba, Cal.
 McInnis, Mrs. F. C. San Francisco.
 McKinley, W. L. Sierra & San Francisco Power Company, San Francisco.
 McKinley, Walter A. San Francisco.
 McKinley, Miss Eunice. San Francisco.
 McMaster, Mrs. H. M. Schenectady, N. Y.
 Nadon, J. A. Westinghouse Electric & Manufacturing Company, San Francisco.
 Neelands, W. L. Western Electric Company, San Francisco.
 Newbert, Lee H. Pacific Gas & Electric Company, San Francisco.
 Newbery, F. E. F. E. Newbery Electric Company, St. Louis, Mo.
 Newbery, C. J. F. E. Newbery Electric Company, San Francisco.
 Newlin, M. E. San Joaquin Light & Power Corporation, Fresno.
 Noack, H. R. and wife. Pacific States Electric Company, San Francisco.
 Ozle, D. P. San Joaquin Light & Power Corporation, Fresno.
 Pence, D. C. Illinois Electric Company, Los Angeles.
 Penrose, C. D. Los Angeles.
 Pitts, H. P. and wife. Pacific Gas & Electric Company, San Francisco.
 Pollard, J. F. Sierra & San Francisco Power Company.
 Pomeroy, J. G. Los Angeles.
 Quinn, E. A. San Joaquin Light & Power Corporation, Fresno.
 Rawls, R. B. U. S. Steel Products Company, Los Angeles.
 Redfield, Lowell and wife. Pacific Gas & Electric Company, San Francisco.
 Redpath, J. W. Secretary California Association of Electrical Contractors and Dealers, San Francisco.
 Reid, H. C. Pacific Fire Extinguisher Company, San Francisco.
 Rogers, Edwin A. Burlingame, Cal.
 Sanderson, H. E. and wife. Bryant Electric Company, San Francisco.
 Sawyer, W. B., Jr. U. S. Steel Products Co., San Francisco.
 Schneider, C. V. Electric Supply Company, Sacramento, Cal.
 Seaver, W. H. U. S. Steel Products Company, San Francisco.
 Seid, M. H. Thomas Day Co., San Francisco.
 Shepard, W. M. California-Oregon Power Company, San Francisco.
 Sibley, Robert and wife. Journal of Electricity, San Francisco.
 Smith, E. P. San Joaquin Light & Power Corporation, Fresno.
 Soulding, C. E. General Electric Company, Los Angeles.
 Statler, T. M. Thomas Day Co., San Francisco.
 Sterling, R. H. and wife. Santa Barbara Gas & Electric Company, Santa Barbara, Cal.
 Stith, E. B. Western States Gas & Electric Company, Stockton, Cal.
 Taylor, Samuel H. Electric Railway & Manufacturers Supply Co., San Francisco.
 Thompson, C. E. Westinghouse Electric & Manufacturing Company, San Francisco.
 Turner, Chas. Sterling Electric Company, Sacramento, Cal.
 Vandegriff, J. A. and wife. National Lamp Works of G. E. Oakland, Cal.
 Van Kuran, K. E. Westinghouse Electric & Manufacturing Company, Los Angeles.
 Volk, E. E. General Electric Company, Los Angeles, Cal.
 Wallace, F. J. Nevada Electric Company, Sacramento, Cal.
 Walthall, E. B. San Joaquin Light & Power Corporation, Fresno.
 Whiting, H. S. and wife. Aluminum Company of America, San Francisco.
 Whittington, W. E. San Joaquin Light & Power Corporation, Los Banos, Cal.
 Wilson, Paul. San Joaquin Light & Power Corporation, Madera, Cal.
 Wishon, A. E. San Joaquin Light & Power Corporation, Fresno.
 Woodbridge, J. E. and wife. Ford, Bacon & Davis, San Francisco.
 Woods, Jas. A. Cal. Elec. and Mech. Engr., Sacramento, Cal.
 Young, Garnett. Garnett Young & Company, San Francisco.

MEETING NOTICES FOR ELECTRICAL MEN

(General interest centers in the coming joint convention of the Pacific Coast Section, N. E. L. A., the Pacific Coast Electrical Supply Jobbers Association, and the California Association of Electrical Contractors and Dealers. In the meantime, reports from several local leagues and sections record meetings of much interest. Los Angeles is devoting all energies to the Liberty Loan Campaign and the Jovian League there reports all meetings postponed up to May 15th.—The Editor.)

The Engineers' Club of Sacramento

The Engineers' Club of Sacramento, on Tuesday evening, April 9th, observed the first anniversary of its organization, with a dinner and an evening of enjoyment at the Land Hotel in Sacramento. As guests of the evening, in addition to the ladies and other local friends, the club was honored by the attendance of Lieutenant S. P. Burman of the U. S. Army, the officer in charge of the construction of the Sacramento Aviation School at Mills, and Lieutenants B. F. Vandenberg and Thos. S. Trail, engineer officers, assisting in this work for our government. Mr. J. Frank Adams of the University of California was also gladly welcomed among visiting friends on this occasion.

Major P. M. Norboe, the retiring president of the club, presented a comprehensive review of the purposes of the organization, which now numbers about 80 members, and of its progress and work during the first year of its existence.

As its officers for the ensuing year the club elected Geo. S. Nickerson, president; Fred M. Miller, vice-president; and P. M. Norboe, secretary; its directors being G. W. Winslow, E. M. McKusick, S. W. Curtis, Clifton Wildman and Albert Givan.

Prominently in view as its service banner was the syn-bolical shield, presented to the club by Mrs. Norboe, and bearing the four stars representing Major J. A. Given and Lieutenants H. C. Darling, in service with the Engineer Corps of the American Expeditionary Army in France; Captain H. H. Blee in service at the aviation camp at Dayton, Ohio, and Lieutenant J. B. Brown, an officer of a pontoon company at Washington Barracks, D. C.

The evening's entertainment was concluded with enjoyable hours of dancing and card playing.

Among the prominent members of this organization are to be numbered the following:

E. A. Bailey, H. W. Bartell of the State Highway Commission, Drury Bulter, County Surveyor; R. G. Clifford, of the Natomas Co.; Melville Dozier, State Reclamation Board; A. B. Fletcher, of the State Highway Commission; and Geo. S. Nickerson, the president of the club.

Seattle Section, A. I. E. E.

At the meeting of the A. I. E. E. Seattle Section on Tuesday, April 16th, Mr. S. C. Lindsay read a paper on the subject of "Recent Additions to the Generating Equipment of the Puget Sound Traction, Light & Power Company." The steadily increasing loads have required successive steps of plant enlargement to care for them. At the White River plant two 10,000 kva. units were installed in 1910. Later on the capacity of these machines was increased to 14,000 kva. by installing

guide vanes to direct the incoming air onto the generators and by enlarging the openings for admitting air into the generator pits. A water spray reduced the temperature of the admitted air. These machines were later rewound, mica insulation capable of resisting a temperature of 125 deg. C. being used, and the capacity was thereby raised to 16,300 kva. Thermo-couples were installed both between turns and between the windings and the laminations to accurately indicate the temperature at any time.

The efficiency of these units is exceedingly high, being as follows:

	Pow.Fact.	Eff.
Full load	100%	97.4%
	80%	96.8%
Half Load	100%	96.0%
	80%	95.0%

In addition to these changes the new 25,000 horsepower unit was installed and at the present time is being tried out preparatory to regular service.

The steam plant at Georgetown (suburb of Seattle) is also undergoing enlargement to be ready for the installation of the new 10,000 kw. steam turbine. This horizontal turbine, operating at 1800 r. p. m. and 165 lb. steam pressure, will almost double the size of the plant, the present equipment being an 8000 kw. and a 3000 kw. vertical turbine.

A report was made that the Associated Engineering Societies of Seattle had suggested joint meetings to be held during the war, and the section voted to hold joint meetings with the other societies.

The next meeting, as announced by Secretary Dunbar, will be addressed by Mr. Shepard of the Bureau of Standards.

The San Francisco Electrical Development League

"The War on the Western Front and Labor in Relation to the War," by Lieutenant James S. Dagger, late of the 29th Battalion, Canadian Expeditionary Forces, occupied the attention of the San Francisco Electrical Development League on April 10, 1918. The speaker discussed in a forceful manner how labor conditions at home so vitally affect the morale of the men at the front. Captain H. F. Jackson, president and general manager of the Sierra & San Francisco Power Company, acted as chairman of the day.

E. C. Hovey, Jr., head of the Sea Service Bureau, Recruiting Service, U. S. Shipping Board, told about intensive training of seamen at the meeting of the league April 17, 1918. W. M. Deming, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, acted as chairman of the day.

The League meeting of May 15, 1918, is to be given over to a discussion of the "Goodwin Plan," by W. L. Goodwin, who for many years was an active factor in the League's affairs.

BUILDERS OF THE WEST—XXVIII



HENRY T. SCOTT

Shipbuilding and the ready transference of intelligence are two great factors of world importance in these momentous times. To Henry T. Scott, president of the Pacific Telephone & Telegraph Company and a master mind in the development of a number of giant enterprises in shipbuilding in the West, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial for posterity to note in recounting those who had the leading part of the upbuilding of our great West.

The Engineers' Club of San Francisco

Lieutenant James S. Dagger, late of the Canadian Expeditionary Forces, entertained the largest gathering of men at the club's luncheon meetings for the current year on April 19, 1918. His subject was "Engineering Problems at the Front." Robert Sibley, editor of the Journal of Electricity, was chairman of the day.

The Engineers' Club is becoming more and more a helpful factor in promoting engineering life in the San Francisco region. The meal service is excellent and all electrical men eligible are urged to make the club rooms their headquarters.

Northwest Society of Highway Engineers

A recent meeting of the Society of Northwestern Highway Engineers, at Seattle, marked the first anniversary of that organization. Among the resolutions adopted was one favoring the registration of professional engineers, one providing for the investigation of salaries paid highway engineers in comparison with other professional men at this time; one pledging the unfaltering support of the society in all activities pertaining to prompt and successful issue of the present world war, and one endorsing rigid and careful inspection of public work and endorsing the organization of the National Inspectors' Association.

At present the organization has 136 members, eight from Washington state, two from Idaho and five from Montana. The other 121 members are from Oregon.

War Convention of Machinery Manufacturers

The enormous problem of manufacturing and supplying machinery and tools sufficient for the carrying out of the government program for the production of ships, shells, guns and aircraft, will be the subject considered at the great "War Convention" of the machinery, tools and supply industry of the country, to be held in Cleveland, Ohio, during the week of May 13th.

One thousand men who are bearing the brunt of the unprecedented demand for machinery will gather from all parts of the country to lay out a plan, with the aid of government officials, to keep the great munition program going at top speed. The big war convention will be a joint meeting of four great national associations—the American Supply & Machinery Manufacturers' Association, the National Supply & Machinery Dealers Association, the Southern Supply & Machinery Dealers' Association, and the National Pipe & Supplies Association, which will meet together in order to co-ordinate their effort toward one goal, "More Ships, More Shells."

San Francisco Section A. I. E. E.

At the April 29th meeting of the San Francisco Section, A. I. E. E., E. R. Shepard, associate electrical engineer with the Bureau of Standards, Washington, D. C., addressed the section on "Electrolysis Mitigation and Other Public Service Work of the Bureau of Standards." Mr. Shepard has been traveling throughout the West and has had opportunity of addressing engineers in many parts of the country on subjects related to the Bureau of Standards work. Having had a number of years experience with the Bureau of Standards, he is indeed well qualified to speak of this important department, and his address was greatly appreciated.

National Chamber of Commerce Endorses Water Power

The membership of the United States Chamber of Commerce formally adopted resolutions calling on Congress to make provision for harnessing the millions in water horsepower that now run wild.

The vote was taken through the more than 1000 commercial organizations throughout the country which compose the National Chamber. Forty-five states, Alaska and Hawaii participated in the balloting, representing a wide range of industrial interests and opinions and reliably indicating to Congress how the business men of the nation look on the water power situation.

The balloting was based on a series of recommendations contained in the report of the Committee on Water Power Development, substantially as follows:

1. That federal legislation encouraging the development of water powers should at once be enacted. Adopted by the almost unanimous vote of 1324 to 6.
2. That authority to grant permits should be vested in an administrative department. Carried by a vote of 1253 to 17.
3. That the permit period should be at least fifty years, any shorter period being at the applicant's option. In favor, 1216; opposed, 42.
4. That tolls should attach only to use of public lands or benefits derived from head-water improvements. Adopted by vote of 1191½ to 40½.
5. That permittees should be entitled to acquire the right to use public lands forming only a small and incidental part of the development. Carried by a vote of 1210 to 25.
6. That recapture should be exercised only upon payment of fair and just compensation. In favor, 1234; opposed, 25.
7. That if recapture is not exercised, the investment of the permittee should be adequately protected. Adopted by vote 1226 to 26.
8. That rates and service should be regulated by state commissions where the service is intrastate, with federal regulation only where several states are directly concerned and do not agree, or there is no state commission. Carried by a vote of 1177 to 57.
9. That if any jurisdiction to regulate the issuance of securities is exercised it should be solely by the state. In favor, 1114; opposed, 117.
10. That no preference should be granted as between applicants amounting to a subsidy from the government creating unequal competition. Adopted by a vote of 1191 to 38.

Meetings in New York

The A. I. E. E. devoted their April 12th meeting to a consideration of papers presented by B. G. Lamme and R. E. Hellmund on "A Physical Conception of the Operation of the Single Phase Induction Motor," and "No-Load Conditions of Single Phase Induction Motors and Converters," respectively.

An event of interest during the last two weeks was the conferring of the John Fritz medal upon J. Waldo Smith, member of the American Society of Mechanical Engineers.

Society for Electrical Development

At a special meeting of the board of directors of the Society for Electrical Development, which was held at the offices of the society, 29 West Thirty-ninth street, New York, during the past month, the following resolution was offered and carried unanimously:

"The general manager to collect information on the best methods of accounting on costs, expenses and earnings in the retail electrical merchandising field, and to arrange this information in a form suited to the needs of the merchants, and report to the committee to be appointed by the chair with power to act, and when approved to print and distribute the report to our members."

THE BEST WAY TO KILL AN ASSOCIATION

Because of the timely application, a repetition of the following suggestions may not be amiss:

Don't attend meeting. If you do attend, come late.

If the weather is a bit disagreeable, stay away.

When you attend, be a grouch and find fault with the officers, what they do and the way they do it.

Never accept office—it is much easier to growl, criticise and find fault than to do things.

Get sore and kick because you are not appointed on a committee—if you are, do not attend the committee meeting, then tell everyone how things really should be done.

When called upon by the committee act indifferent, as disagreeable as possible and say nothing; if you do say anything, show signs of being bored and hurt.

Hold back in your dues as long as you can, or don't pay them at all; and if asked to get a new member, act as if you were peeved and too big for such work—promise to and then don't do it at all.

When the association adopts a resolution, ignore and belittle it—pretend it was for your competitor but not for you, and when questioned about it, plead ignorance.

Don't do any more than you have to; what you do, do grudgingly and when others get in the traces and roll up their sleeves and willingly and unselfishly do their utmost to help matters along, set up a howl that the association is run by a clique.

HAPPENINGS IN THE INDUSTRY

Fire Loss to San Francisco Firm

A fire in the Merritt Building, 612 Howard street, early Saturday, April 20th, burned out Rieber's Laboratories on the sixth floor. The prompt action of the fire department confined the flames to the upper floors, but the offices and warehouse of Garnett Young & Co., occupying lower floors and basement, were thoroughly drenched with water, and forced this concern to establish temporary quarters with Johns-Manville Co., 182 Second street.

Mr. Young reports that there has been but slight interruption to business, as all the current records were saved and

but a small percentage of the stock was affected. This company has already returned to its own establishment and has resumed the filling of orders.

Mr. Young declares that he has just had the most practical demonstration of trade co-operation, inasmuch as all of his local customers and competitors, alike, have offered to share quarters with him and to give any other assistance in their power. Mr. Young has long been one of the most energetic and capable young business men in the electrical industry in the West and the sincerest best wishes and congratulations of men of the industry go with him over his good fortune in escaping the usual disasters incident to fire.

Changes and Beginnings

The Delta Electric Company of Marion, Indiana, manufacturers of electric lighting devices and specialties, have opened a factory branch at 686 Mission street, San Francisco, in charge of O. E. Yates, Western sales manager.

Announcement has just been made by the officials of the Westinghouse Electric & Manufacturing Company that the Copeman Electric Stove Company will be merged in a new company to be known as the Westinghouse Electric Products Company, with headquarters and factory at Mansfield, Ohio.

The M. J. Walsh Electric Co. are fitting up a new retail establishment on Fourth street, between Washington and Stark, where they expect to make the future home of the company, and from the extensive alterations it is safe to say that the new store will be in all ways a strictly modern and up-to-date electrical display room. They expect to be moved and ready for business about June, 1918.

Electric Materials Company, 589 Howard street, San Francisco, the Pacific Coast representatives of Ward Leonard Electric Co., Mount Vernon, N. Y., announce that they now have a stock of Ward Leonard Field Rheostats, Amature speed controllers, and a representative line of vitreous enameled resistance units.

New Power Loads

The Stockton, California, division of the Western States Gas & Electric Company has accepted contract with the Sacramento Chamber of Commerce, acting for the United States Government, covering the electric energy requirements of the new aviation field now in course of construction at Mills, California. The agreement calls for a minimum of 300 horsepower to be delivered at 2300 volts. A small substation will be built at one end of the field to house the high tension transformers.

The Western States Gas & Electric Company of Richmond, Cal., has accepted contract with the Western Pipe & Steel Company for 65 horsepower in motors.

The San Diego Consolidated Gas & Electric Company will lay additional cables in the bay from the mainland across to North Island to furnish light and power for the federal aviation school there.

Western Electric at Spokane

A branch of the Western Electric Company has been opened at Spokane in the building formerly occupied by the Pacific States Telephone Company at 165 Howard street. The western third of Montana, northern half of Idaho and eastern Washington will be covered from the Spokane office. The business is to be by wholesale only. A \$100,000 stock has been installed. This is the latest house to be established, the company operating 35 other houses all

Appeals from Six Cent Fare

The city of Portland, Oregon, has appealed from the six cent street car rate for passengers established by the public service commission. All of the circuit court judges before whom the case was tried sustained the commission and this appeal is to the supreme court from that decision.

Coast Counties Gas & Electric Company

The report of the Coast Counties Gas & Electric Company for 1917 reflects the higher costs of operating public utilities. The Coast Counties' report, which was presented at the annual meeting, shows gross earnings for 1917 of \$391,158, as compared with \$363,970 for the previous year. The increase in gross earnings was sufficient, however, to offset higher operating costs, for net operating income for last year showed a slight increase over 1916. Operating expenses and taxes last year totaled \$221,944, as compared with \$196,000 for 1916. A larger allowance for depreciation last year cut the surplus down about \$2000 below that shown at the close of 1916. All retiring directors and officers, with S. Waldo Coleman as president, were re-elected at the meeting.

Traction Company Sued

Corporation Counsel Hugh M. Caldwell of Seattle has filed in the superior court of King county a suit on behalf of the city against the Puget Sound Traction, Light & Power Company, for \$72,443, alleged to be due for the company's street franchises in 1917. The suit is similar to the one filed a year ago and against which the company appealed to the supreme court. According to the complaint, the company holds its franchise under an agreement to pay 2 per cent of its gross earnings to the city. These earnings are said to be \$3,554,933 for 1917.

Company Must Make Extensions

The Public Service Commission of Oregon will not accept from the Portland Railway, Light & Power Company a new set of rules providing that, in effect, customers shall stand the brunt of the burden of expense for extension of the pole lines and for furnishing transformers for customers. Superintendent Caldwell is advised in a letter by Chairman Miller, of the commission, that while he appreciates the necessity of conserving men, money and materials, nevertheless he believes that the company should make such extensions as are necessary for properly covering the territory covered by the utility. He adds, however, that the utility should meet every demand for extensions which is made upon it, but, on the other hand, should not refuse a request for an extension merely because it does not show a chance for an immediate profit. Under the plan for extensions submitted by Caldwell, the consumer would pay the expense of the extension by making a deposit, to be repaid within five years. This repayment would be made out of money derived from the consumer's business. In the event the business did not amount to the size of the deposit within the five years, repayment to the consumer would cease and the company would retain the balance of the deposit.

Light Plant Making Money

According to the report of Superintendent of Lighting J. D. Ross of Seattle, the revenues of the lighting department for 1917 were \$1,329,808.97, and expenditures included \$802,500.27 for operating expenses, \$110,746.21 for interest, \$9,986.08 for miscellaneous items, \$6,115.16 for other losses, and \$15,717.08 for redemption and depreciation.

American Telephone Company Issues Report

The American Telephone and Telegraph Company reports for the quarter ended March 31 last:

	1918	1917
Total operating revenue.....	\$14,738,008	\$13,392,249
Expenses	1,597,190	1,494,647
Net earnings	\$13,140,818	\$11,897,602
Interest	2,339,995	2,143,885
Balance	\$10,800,823	\$ 9,753,717
Dividends	8,714,491	7,784,303
Balance	\$ 2,086,332	\$ 1,969,414

The Bell Telephone System in the United States reports for the quarter ended March 31 last:

	1918	1917
Total operating revenue	\$76,300,000	\$66,641,252
Operating expenses	53,690,000	44,022,816
Net operating revenue	\$22,610,000	\$22,618,436
Uncollectible revenue	330,000	372,062
Taxes	5,480,000	3,947,177
Operating income	\$16,800,000	\$18,299,197
Non-operating revenue	2,470,000	1,893,491
Gross income	\$19,270,000	\$20,192,688
Total deductions	6,505,000	5,943,814
Net income	\$12,765,000	\$14,248,874
Dividends	9,830,000	8,801,203
Surplus	\$ 2,935,000	\$ 5,447,671

Great Western Power Elects

At the annual meeting of the Great Western Power Company of California and its subsidiaries, the Great Western Power Company and California Electric Generating Company, held recently, directors and officers were elected to serve for the ensuing year. Elmer H. Cox was elected a director to succeed Benjamin H. Dibblee, now a captain in the National Army, and Charles F. Hunt, vice-president of the Anglo and London-Paris National Bank, was named to succeed Dr. Washington Dodge. Other directors were re-elected as follows:

Mortimer Fleishhacker, Guy C. Earl, Herbert Fleishhacker, James Irvine, W. H. Spaulding, Mark L. Gerstle, A. C. Bedford, H. P. Wilson, W. S. Crandell, R. B. Young and A. W. Burchard.

Electric Ranges Save Coal

Tests made at the State College of Washington indicate that the average cooking efficiency of the kitchen coal range is between 2 per cent and 3 per cent. Hence not only at the present time, because of the needs of the war situation, should fuels other than coal be used for cooking, but also at any other time.

This is a good time to educate the consumer to the fact that where the electric range displaces the coal range, electric cooking saves 100 per cent of coal where electricity is generated by water power or oil, and 66 2-3 per cent where it is generated by coal.

U. S. to Help Hydro-Electric Units

The government will give financial aid to the development of hydro-electric projects in California if they can be shown to be essential to war activities, according to word brought back from Washington by D. M. Folsom, Federal Petroleum Administrator for the Western states. To obtain such assistance, said Mr. Folsom, companies asking it must show concrete projects, that they are unable to secure money through ordinary financial channels, and that the added power their projects would produce would go into shipbuilding, irrigation for food production, or other activities necessary to the prosecution of the war.

Ordnance Department Positions Available

The following positions are open and will be filled through civil service examination. Entrance compensation ranges from \$800 to \$6000 per year.

An announcement giving details of requirements may be examined at the office of the Society, or copies may be obtained by writing to "Civilians' Personnel Section, Office of Chief of Ordnance, U. S. Army, 1333 F St., N. W., Washington, D. C.," and referring to letter V-230-H.

Position—	Entrance Compensation	Announcement No.
Inspector, powder and explosive chemists.....	\$1600-2400	108
Asst. inspector, powder and explosive chemists.....	1000-1600	108
Asst. inspector machine guns	1200-1500	154
Asst. inspector artillery wheels, gun carriage forgings, castings and steel mill products...	1200-1500	139
Inspector gun carriages	1800-2400	136
Asst. inspector gun carriages	1200-1500	136
Asst. inspector carriage parts	1000-1500	136
Junior accountant	1200-1800	155
Cost accountant supervisor	2400-6000	157
Mechanical draftsman	800-1800	242
Munitions inspector artillery ammunition.....	1600-2400	1240
Inspector small arms	1600-2400	1550
Asst. inspector small arms	800-1600	1550
Metallurgical chemist	1600-2400	1617
Asst. metallurgical chemist	1000-1600	1607
Clerk qualified in statistics or accounting.....	1000-1800	2030
Inspector small arms ammunition	1500-2400	2078
Asst. inspector small arms ammunition.....	800-1500	2078
Statistician	*1800	2147
Asst. inspector of cannon (forging operations).....	1200-2400	2179
Asst. inspr. of cannon (machining operations).....	1200-2400	2179
Asst. inspector gunfire control instruments....	1200-1500	2232
Production clerk	1500	2233
Inspector material for small arms	1600-2400	2234
Asst. inspector for small arms.....	1000-1600	2234
Accessory inspector small arms ammunition....	1200-1900	2259
Ballistic inspector small arms ammunition.....	1200-2100	2259

*And expenses upward and downward.

We are informed that in the positions set forth in the above announcements, there is practically no limit as to the number of persons who can be utilized.

Power Bonds on Sale

The Spokane & Eastern Trust Company is giving its customers the opportunity to buy bonds of the Montana Power Company, which have been purchased by a New York syndicate. They are 25-year, 5 per cent bonds. This is an issue of \$4,000,000, one of the largest bond issues of the Northwest since the war opened. It is probable that bonds are partially for refunding and partially for extensions.

Light Plant a Money Maker

In its report to the United States Census Bureau the city light department of Tacoma gave detailed figures of the business done by the municipal light and power plant. The gross income of the plant amounted to \$631,721.30 for the year, and the expenses \$470,132.77, leaving a profit of \$158,588. Expenses do not include interest on the bonds or cost of extending the system. The wages of the employees and the officials in the department were \$160,879.54 for the year. The department furnishes power to 974 motors with horsepower totaling 14,629. The city plant has customers to the number of 20,739, and there are 2641 street lamps in the city. In 1917, 61,318,250 kilowatt hours of power were generated.

Power Rates Declared Unfair

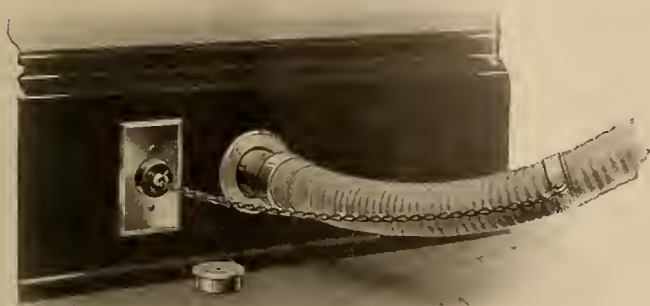
The state public service commission of Washington has filed formal complaint against the Washington Water Power Company and the Spokane Heating and Lighting Company, alleging that the rates charged and the rules and practices of the company are unremunerative, unfair and tend to create a monopoly. The commission holds that the manner of the company in handling rates causes what is termed unfair discrimination against other patrons outside certain districts, as a result of which the companies are not charging enough to keep up their plants.

LATEST IN EVERYTHING ELECTRICAL

(The fan season is on and is inaugurated by new lines from all the manufacturers, among which two are here presented. The general tendency is toward concentration on a few types of proved popularity and serviceability. For the convenience of the hotel type of buildings, the new vacuum cleaner with automatic control which insures against waste of current, will prove of interest.—The Editor.)

Automatic Control of Stationary Vacuum Cleaner With Flush Receptacle

Stationary vacuum cleaners when installed in large apartment buildings, hotels, club houses and halls, have hose connections in many locations, and switches on each floor to start and stop the cleaner. With such a system, an employer or tenant using a cleaner connection on one floor, and knowing that others are being used elsewhere on the system, depends on them to close down, with the usual result that the plant continues to run and with the resultant waste of current.

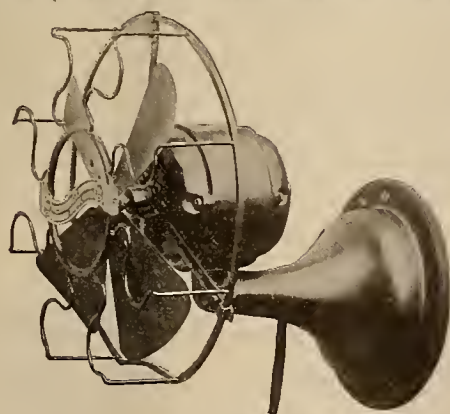


Use of C-H receptacle on stationary vacuum cleaner

To overcome these objections, the Cutler-Hammer Mfg. Co., of Milwaukee, Wis., has designed a vacuum cleaner receptacle, the cap of which is attached to the hose, as shown in the accompanying illustration. Inserting the cap in the receptacle closes an auxiliary circuit to the starting equipment. In the case of small stationary outfits in private homes, the cap can be used to close the motor circuit direct. This automatic control insures against waste of current and unnecessary operation of the cleaner.

WESTINGHOUSE FANS FOR 1918

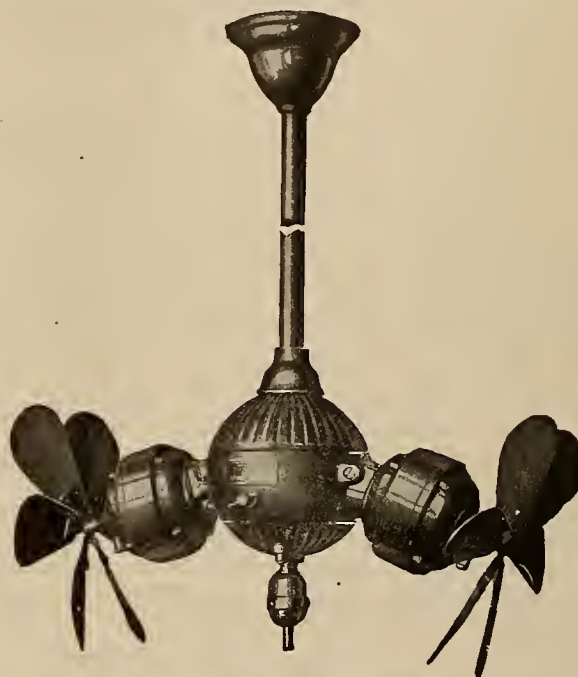
Concentration on those models whose serviceability and popularity have been amply tested has been the aim of the



Westinghouse wall fan

1918 changes in the line of fans made by the Westinghouse Electric & Manufacturing Company. Where both four and six-blade fans have been offered, the six-blade fans have been eliminated, and some of the less popular ceiling fans have been withdrawn.

As a pioneer in the introduction of drawn steel frames, the Westinghouse Company soon secured a prominent place in the public's esteem for the lightness, attractive shape and finish of its fans. Tests show the power economy of these fans to be exceptionally high, while their operation is quiet. Since an oiling all around is required but once a year, maintenance is reduced to a minimum.



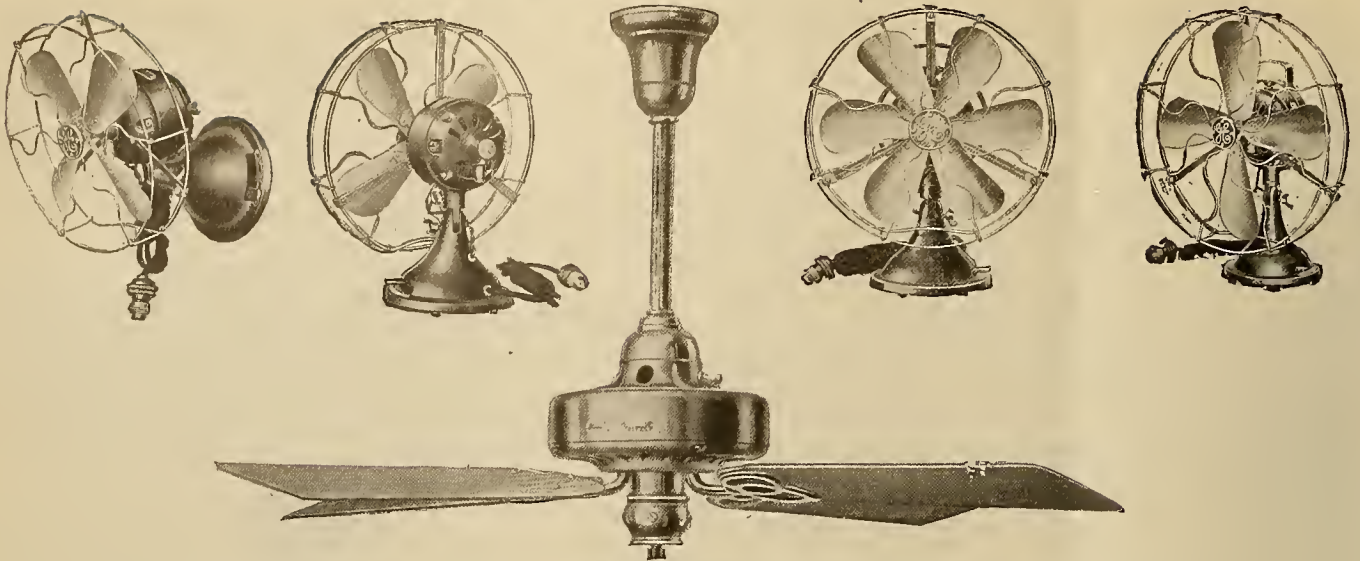
Ceiling type gyrating fan

All portable fans are provided with a hinge joint to adapt them to mounting on either desk or wall. The oscillating mechanism can be adjusted for a "swing" of from 45 to 90 degrees at the rate of 8 per minute, or can be locked out of service entirely. A tilt of 20 degrees from horizontal can also be had.

The Westinghouse Whirlwind, an eight-inch fan at a popular price, has the drawn steel construction characteristic of Westinghouse fans. From it have been omitted, however, such refinements as speed control, highly polished blades, and others not necessary for durability. Current can be cut off by separating the attachment plug.

The remainder of the portable line includes both oscillating and non-oscillating fans of 10, 12 and 16-inch diameters. Ten-inch fans have zinc-plated, polished and lacquered blades; 12 and 16-inch models have polished and lacquered brass blades. Finish of all other parts is dull black. All models are packed in substantial boxes, and include attachment plug and 8 feet of cord.

Westinghouse gyrating fans are furnished for either floor or ceiling mounting. The fans themselves are six-blade, 12-inch models, attached to a rotating body which turns on a ball bearing. One of the fan motors is geared to a mechanical drive operating on a central stationary pulley. Thus the rate of revolution does not vary with the air-reaction. Breeze at any angle from horizontal to 35 degrees below can be secured. Finish is dull black throughout, save for the blades, which are polished brass. No guards are furnished.



TYPES OF G-E FANS

Both ceiling, desk and wall fans are represented. Ceiling fans are finished in dark green enamel, except the blades, which are in mahogany.

GENERAL ELECTRIC FANS FOR 1918

A number of lesser changes, dictated by engineering experience, are noticeable in the General Electric fans for 1918. One novel departure is in the finish, as all metal parts are now enameled a dark green, and the blades are lacquered brass. All of these fans are readily adjustable for either desk or bracket use. They are furnished with standard cords and plugs.

The complete line of General Electric Company's fans for this season will include 9-inch, 12-inch, and 16-inch, oscillating and non-oscillating, four blade fans in both direct and alternating current. Six blades, oscillating fans in 12 and 16-inch sizes are made for alternating current only.

Ceiling fans are furnished in 52-inch and 56-inch sizes for both alternating and direct current, respectively. They are finished in dark green enamel, except the blades which are in mahogany.

Ventilating fans for 1918 will be handled in 12 and 16-inch sizes, six blades, in both alternating current and direct current. These fans, finished in green enamel, with lacquered brass blades and trimmings, can also be furnished with special bearings to operate in a vertical position.

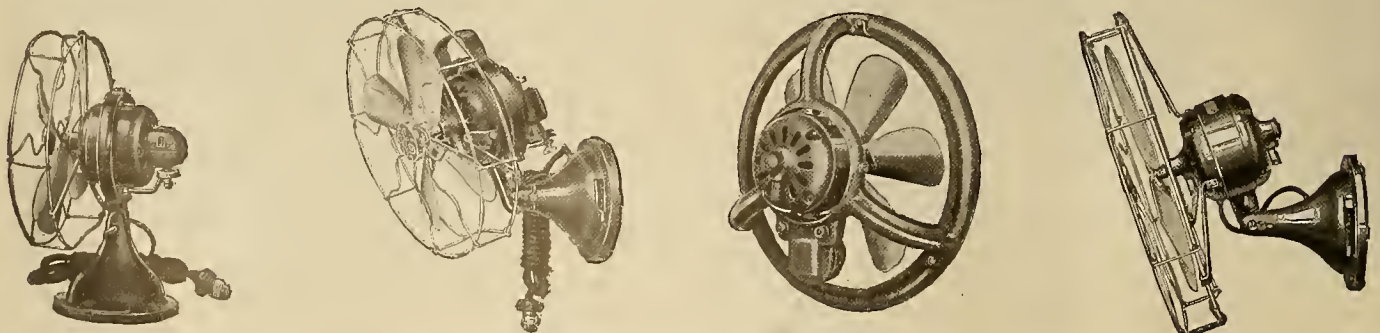
In standardizing to three sizes of desk and ceiling fans the company's engineers feel that they have provided a fan suitable for every use. The 16-inch fan is designed particularly for service in large rooms, stores, restaurants, etc., where a high velocity air discharge is the most effective. The 12-inch fan is designed for rooms and enclosures of medium size where a moderate strong air velocity is desirable. Noise is reduced to a degree consistent with general operating characteristics. The 9-inch fan operates with remarkable quietness and provides an alternative for those places where a strong breeze from a larger fan is objectionable. They are

extremely popular in the home and on the desk in the private office.

All alternating-current fans will operate satisfactorily over a range of 5 per cent above, or below, normal voltage, of frequency. The sum of the variation in voltage and frequency must not exceed 5 per cent. Direct-current fans will operate over a range of 10 per cent above, or below, normal voltage. Alternating and direct-current fans can be furnished for voltage within the range of 30 to 250. Alternating-current fans can be furnished for frequencies within the range of 25 to 60.

All frames and pedestals are made of cast iron, except the 9-inch alternating-current fan, which has a pedestal of cast iron and a frame of drawn metal. All 12-inch and 16-inch G-E fans are arranged so as to permit of adjustment in a horizontal or vertical plane. On the 9-inch fans, because of the very light weight and ease of moving about and rotating the entire motor, no provision is made for horizontal adjustment of the motor body with respect to the base. All G-E fans can be converted from desk to bracket type by simply turning a thumbscrew.

The G-E fan blade is wider at the hub end than the ordinary blade, and has a pitch that increases toward this point. The effect is to project more air from the center of the fan, and thus increase the air velocity at this point, preserving a broad distribution. The large radius at the advancing tip or cutting edge of the blade reduces the noise of high-speed fans. The blades are formed to shape under heavy pressure and riveted to a rigid spider whose outer ends are spread out to embrace a large surface of the blades. The result is a very strong fan, free from vibration and consequent noise. The liberal space allowed between the fan blades and the motor body insures a free air intake.



G-E FANS FOR VARIOUS PURPOSES

All metal parts are enameled in dark green and the blades are lacquered brass.

BOOKS AND BULLETINS

Furnace Design in Relation to Combustion

The Bureau of Mines, Department of the Interior, after several years of experiments in fuel combustion in a special furnace, makes the announcement that from the results it is possible to design a furnace with considerable more assurance as to its capabilities than has heretofore been possible. Starting with the analysis of the coal to be used and the rate at which it is to be burned, the furnace dimensions in feet and inches can be designed with a reasonable assurance of obtaining a desired degree of completeness of combustion. The bureau has just made a report on this subject, Bulletin 135, "Combustion of Coal and Design of Furnace," by Henry Kreisinger, C. E. Augustine, and F. K. Ovit. While the bulletin is especially for those interested in the design or reconstruction of fuel-burning furnaces, it contains much of interest to the general engineer interested in fuel problems.

Mining Bulletins

"Percentage of Extraction of Bituminous Coal." Bulletin 100 of the Engineering Experiment Station, by C. M. Young, assistant professor of mining research, covers the subject with special reference to Illinois conditions.

Permissible electric mine lamps and equipment are listed in the monthly publication of the Bureau of Mines covering "Coal Mine Fatalities in the United States."

"Five Ways of Saving Fuel in Heating Houses" is the subject matter of a paper by Henry Kreisinger, published as Technical Paper 199 by the Bureau of Mines.

"Accidents at Metallurgical Works in the United States" for the year 1916 are reported in Technical Paper 201 of the Bureau of Mines.

Safety Bulletins

"Occupational Hazards at Blast Furnace Plants and Accident Prevention" is the title of Bulletin 140 of the Bureau of Mines. The data was compiled by Frederick H. Willcox, and is based on records of accidents at blast furnaces in Pennsylvania in 1915.

The United Railroads of San Francisco have issued an extremely valuable forty-eight page booklet entitled "For Humanity's Sake: An Appeal to Automobilists for Safety," which covers the usual accidents in which street cars may be involved in a graphic way, with an appeal to automobilists and pedestrians for caution.

Twenty-eight fatal injuries due to electric current are listed in the report of the Industrial Accident Commission of the State of California for the year ending June 30, 1917.

A valuable series of bulletins is being published by the National Board of Underwriters, entitled "Safeguarding America Against Fire."

Miscellaneous

The Annual Report of the City of Glendale, Cal., for the year ending June 30, 1917, is ready for distribution. The report contains complete data on the development and maintenance of the city's electric system, as well as financial reports of the various departments, compiled by the city manager.

The census report on "Steam and Electric Cars, and Railroad Repair Shops," of the general series on manufactures for 1914, has recently been given out by the Department of Commerce. Some 8483 horsepower motor capacity is reported from the electric car factories alone, against 2938 in 1904.

Regular bulletins covering such subjects as changes in enemy trading lists, new rulings on exports and imports, and the like, are issued by the War Trade Board from Washington and sent to those interested in the matter contained.

Bulletin No. 586 of the Department of Agriculture is devoted to progress reports of experiments in dust prevention and road preservation, carried on in 1916 by the office of Public Roads and Rural Engineering.

A discussion of the Southern California floods of January, 1916, is contained in a bulletin to be issued early in April by the U. S. Geological Survey. The report will be of special value to engineers in every part of the country who are interested in flood control.

An index to descriptive bulletins and sheets complete to pany's publication bureau.

January, 1918, has been issued by the General Electric Com-

Digest of Electrolysis Investigations

Samuel S. Wyer, consulting engineer of Columbus, Ohio, has made a digest of publications of the Bureau of Standards on the Electrolysis of Underground Structures, caused by the disintegrating action of stray electric currents from electric railways. This is a valuable compilation in compact form of verbatim quotations of what a disinterested government bureau has said on electrolysis. It represents an analysis of fourteen reports and should be of especial value to public utilities as well as of general interest to all electrical workers who come in contact with the problem. Copies may be obtained from the Bureau of Standards, Washington, D. C.

Code of Lighting School Buildings

The Illuminating Engineering Society announces that the revised edition of its Code of Lighting School Buildings is now being placed in type. It will be remembered that the first edition of this code was circulated several months ago for the purpose of obtaining discussions and criticisms. As a result, some one hundred communications have been received from lighting experts, architects, educators and school superintendents. These have been carefully considered by the Committee on Lighting Legislation in its revision of the technical data and principles of school lighting which are embodied in the code. While the code is intended primarily as an aid in formulating legislation relating to the lighting of school buildings, it is also intended for school authorities as a guide in individual efforts to improve lighting conditions.

New Safety Switch Bulletin

Safety auto-lock switches are described and illustrated in some detail in special publication No. 1585-A, just issued by the Krantz Mfg. Company, Inc., of Brooklyn, N. Y. These switches are designed for use on circuits wherever the ordinary knife switch may be applied. They are especially designed for safety, it being absolutely impossible to touch the live parts, regardless of the position of the switch or of the door.

Radio Communication

by John Mills, Research Department, Western Electric Company, Inc.; size 5x8 in.; 206 pages; published by the McGraw-Hill Book Company, New York, and for sale by the Technical Book Shop, San Francisco. Price, \$1.75.

This book is the substance of a course of lectures given by the author during the summer of 1917 to a company of the U. S. Reserve Signal Corps troops. In order that the work may meet the needs of men with varying degrees of electrical training, the author has adopted a method which involves very little mathematics and but a limited knowledge of physics. Matter which is of purely historical or theoretical interest was omitted from the book, which is strictly a treatise for the man who wishes a compact textbook for practical use. The subject matter involves a discussion of the fundamental considerations on alternating currents, telephone receivers, the vacuum tube, the detection of high frequency, the production of damped sinusoidal currents, the production of undamped high frequency currents, radio telegraphy and telephony, practical appliances and methods—and an appendix covering the problems of transmission over wire circuits.

For the man who wishes to get a working knowledge of the field in a short time the book is both clear and complete—a valuable textbook.

NEW ELECTRICAL DEVELOPMENTS

(A big irrigation project under way in Oregon calls for the application of electricity. The rejection of the bond issue for a new city power plant by Tacoma, and the awarding of several lighting contracts further mark activities in the Northwest, as also in the Pacific Central District. Progress on the Hetch Hetchy power development is further reported. Considerable activity in the granting of franchises for electric light and power lines is to be noted in the Southwest and Inter-Mountain Districts.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—An ordinance has been adopted by the city council for the installation of cluster lights on Howard avenue.

SEATTLE, WASH.—The city council has granted the National District Telegraph Company a franchise to install and operate a system in Seattle.

CENTRALIA, WASH.—The city commission has awarded contract to the Devore Electric Company for furnishing street lamps to the city for one year.

COTTAGE GROVE, ORE.—Machinery has been received by the Cottage Grove Electric Company which, when installed, will double the present output of the plant.

CHELAN FALLS, WASH.—The Chelan Falls Power Co. has been incorporated by Geo. D. and Amelia M. Brown and R. C. Kennedy, with a capital stock of \$150,000.

TACOMA, WASH.—The city may construct its electric lines across the Hylebos waterway and is asking the county commissioners to change plans for the proposed bridge over the waterway.

COLVILLE, WASH. — The Stevens County Power & Light Company has asked for a franchise to operate electric lines along the Lay Pray Bridge Road from the Stensgar Road to Springdale, Wash.

TACOMA, WASH.—At the election held on April 16th, the voters of Tacoma rejected the proposition of bonding the city in the sum of \$4,000,000 for construction of a new city electric power plant, the vote being almost four to one against the proposition.

PORTLAND, ORE.—To finance construction of the Northwestern Electric Company's steam auxiliary power plant in Portland, which is estimated to cost in excess of \$1,500,000, an issue of first mortgage 6 per cent bonds has been sold to the E. H. Rollins & Sons of San Francisco.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company proposes to construct a coal conveyor, concrete tunnels and hopper adjacent to their power house at 6600 Fourteenth avenue S. Construction is to start at once, and the completed work is to cost \$30,000. The Stone-Webster Company will do the construction work.

PORTLAND, ORE.—Plans are under way whereby 4000 acres of the fertile lands tributary to Clover Leaf, a town 25 miles east of this city, will be brought under irrigation by the installation of nine big pumps stationed at various points along Lost River. The motors and pumps have been ordered and will be in place by the first of May.

SNOHOMISH, WASH.—Among the improvements being made at the plant of the Snohomish Dairy Products Company is the installation of electric motors in several departments. Energy is supplied by the local company. An electric laboratory, with testing appliances, including an electric vacuum oven and computing instruments, has also been installed.

SPOKANE, WASH.—The city council has awarded the Washington Water Power Company a contract to install the new ornamental lighting system on Post street from the east end of the Post street bridge to the north side of Third avenue, at \$40,545. The contract includes maintenance of lamps and furnishing electricity for same for a period of 10 years.

SEATTLE, WASH.—There is possibly to be a change in the plan for the municipal elevated railway of the city as an-

nounced by City Engineer Dimock that will bring a possible saving of \$10,000 to the city. It is proposed to drop the road at Holgate street, and from there to Spokane street, three-quarters of a mile, to construct it on the street surface level.

SEATTLE, WASH.—A. L. Rutherford of Tacoma has been awarded contract for construction of the first section of the municipal elevated street railway at Seattle, which is to tap the shipyards district. The first contract will cover the piling and trestle for the section of the line from Holgate avenue to Washington street on Railroad avenue. The bid is for \$42,262.

HOQUIAM, WASH.—The city council has entered into a contract with the Grays Harbor Railway & Light Company of Aberdeen for lighting the streets of the city for a period of five years. Under the terms of the contract the company is to install and maintain 220 incandescent lamps. In relocating lamps or placing new lamps the city is to bear the expense of erecting poles and stringing wires.

OLYMPIA, WASH.—The Yelm Development Company of Yelm was recently incorporated with a capital stock of \$11,000. The purpose of the company is to own and operate lines of transportation and communication, railways and telephone lines being specifically mentioned in the papers. The incorporators of the new company are: L. J. Mosman, J. P. Martin, A. N. Rice, Chester Thompson, J. H. May, A. G. Cook, H. H. Goodwin, A. K. Thompson.

OLYMPIA, WASH.—State Hydraulic Engineer Marvin Chase has received the following applications for permits to appropriate the public waters of the state: William F. Keller, 0.5 second feet from Copper lake, purposes of irrigation; P. C. Kaylor, 9000 second feet from the Spokane river, for development of electric power; George W. Chute, springs and seepage, domestic use and irrigation, 20 acres; Western Washington Power Company, application for permit to construct reservoir and store unappropriated waters of the Baker river, 30,000 acre feet for production of power, estimated cost of development, \$1,000,000.

PACIFIC CENTRAL DISTRICT

REDDING, CAL.—An initial expenditure of \$40,000 toward a municipal lighting system was approved by Redding voters, 3 to 1.

SEBASTOPOL, CAL.—The LeBaron Company of Valley Ford is shortly to install a complete electrical plant at the Norabel Farm.

WILLIAMS, CAL.—The board of city works is advertising for bids for the furnishing of electric power to the Grimes lighting district.

REDDING, CAL.—The city trustees are planning to install a \$40,000 lighting system.

SAN FRANCISCO, CAL.—The Juneday Mining and Milling Company, operating at Crescent Mills, Plumas county, expects to construct a power line this spring.

SACRAMENTO, CAL.—The Sterling Electric Company has been incorporated by W. A. and Charlotte Weight, C. E. Turner, T. L. Nightingale and Lee Gehhart, with a capital stock of \$25,000.

ALAMEDA, CAL.—The contract for furnishing two 500 kva. oil cooled transformers was awarded by the board of pub-

lic works to the General Electric Company, Rialto Building, San Francisco, for \$3800.

MONTEREY, CAL.—The city council has determined to proceed with the work of extending the electrolier system on the west side of Main street. The city engineer has been instructed to prepare plans and specifications for the work.

VISALIA, CAL.—Mt. Whitney Power & Electric Company has applied to the State Railroad Commission for confirmation of a new form of contract whereby new patrons will pay a portion of the cost of installing new service lines.

HOLLISTER, CAL.—The most needed improvement at this time in Hollister is an electrolier system in the business district. It is hoped that the town board will take the initiative in the matter by devising a definite plan for financing the work.

SAN FRANCISCO, CAL.—Southern Sierras Power Company is to build a 63-mile transmission line from Rush Creek in Mono county to Bishop Creek in Inyo county, at a cost of \$270,000. W. L. Huber, First National Bank Building, is consulting engineer.

HANFORD, CAL.—At a meeting of the Lemoore Farm Center the report of the committee appointed to investigate the securing of electric light and power in the territory surrounding Lemoore, showed that on a line 14 miles in length there are upwards of 85 prospective subscribers.

LODI, CAL.—Bids were opened by the trustees for furnishing motors to run pumps in the new municipal well. Bids were submitted by three concerns, the General Electric Company, Fairbanks-Morse, and the Superior Manufacturing Company. The awarding of the contract was laid over until the next meeting.

SAN FRANCISCO, CAL.—Suit for \$865,250 damages was filed against the city and county of San Francisco by the United Railroads. The United Railroads demands this amount of compensation for alleged losses of value to its Market-street franchise, due to construction by the city of municipal railway tracks in Market street.

YUBA CITY, CAL.—Work has commenced on the new Northern Electric depot, to be built at Bridge and Plumas streets. The old buildings used as a depot have been moved across the tracks. The new depot, it is expected, will be ready for occupancy within two months. It will be Mission design and modern in every respect.

SONORA, CAL.—The work on the power transmission line from Early Intake to the top of Priests Hill, on San Francisco's Hetch Hetchy water enterprise, has been nearly completed and electric power will soon be available in the big tunnel now under construction. Over one hundred feet of tunnel has already been constructed by hand labor and is ready for the concrete.

FRESNO, CAL. — In order to meet the increasing demands of the oil companies for electrical service in the Kern River field, the San Joaquin Light & Power Company is erecting a new substation just east of the Standard reservoir farm. This station will transform current transmitted from the Crane Valley power house district at 60,000 volts to the lower voltage required in the oil field operation. The equipment will consist of four 1000 kva. transformers with necessary switches, etc.

THE PACIFIC SOUTHWEST

CLOVIS, N. M.—The sum of \$25,000 has been voted for electrical improvements.

LOS ANGELES, CAL.—Henry P. Wallace has sold out his electric business to Philip Forve.

CLOVIS, N. M.—A bond issue of \$55,000 for improvements in water, light and sewer systems was voted at an election at Clovis.

LOS ANGELES, CAL: — The Bannister Hydro-electric Company has been incorporated by G. R. Bannister, Robert Bannister, P. H. Brown and D. Satler, with a capital stock of \$200,000.

BRAWLEY, CAL.—Plans have been laid to drill a deep well for irrigating water in the Borego Valley, 40 miles northwest of Brawley. The well will be sunk by owners of land in the Borego Valley.

ORANGE, CAL.—Plans and specifications for ornamental street lighting system have been ordered by the city council and the city engineer has been instructed to prepare plans to be submitted as soon as possible.

LOS ANGELES, CAL.—The city electrician has informed the board of public works that it would cost about \$3220 to install an ornamental lighting system of forty posts in Hollihebeck Park and maintain a system for one year.

YUMA, ARIZ.—Application has been made to the board of supervisors by the Imperial Oil Mills for a franchise to construct electric light and power lines along all public highways in what is known as Yuma Valley, in Yuma county.

SAN DIEGO, CAL.—The board of supervisors is advertising for bids for the installation of an electric system and the furnishing of electric current for lights in the Sierra Vista Public Highway Lighting District, as installed at this time.

SAN DIEGO, CAL.—Final approval of plans for the naval air school buildings to be erected at North Island has been granted by the bureau of yards and docks at Washington. Sewage, gas, electric and water mains will be installed.

LOS ANGELES, CAL.—Notice is given that application has been made to the board of supervisors for a franchise granting right to construct and maintain electric distributing and transmission system along public highways, streets, etc., in Los Angeles county.

IMPERIAL, CAL.—The county board of supervisors is advertising for bids for the purchase of a 12-inch electric driven hydraulic dredge and necessary equipment, for immediate delivery at a point in the main canal of Imperial Irrigation District near Hanlon Heading.

WILCOX, ARIZ.—An ordinance was adopted by the common council granting to the Mountain States Telephone and Telegraph Company the right to erect and maintain along streets and public ways, poles, wires, etc., for the maintenance and operation of a telephone system.

LOS ANGELES, CAL. — The public service commission has awarded a contract for the laying of a submarine cable across the main channel in the harbor to serve the substation to be established at Fish Harbor. It will supply city power to the proposed plant of the Southwestern Shipbuilding Company.

KINGMAN, ARIZ.—The Hackberry Silver Mining Company has completed contracts for the erection of a 200-ton milling plant and big power plant for both mine and mill. The power plant is to of sufficient capacity to take care of the lighting and power of the nearby community and for the mill when further enlarged.

SAN DIEGO, CAL.—Cables are to be laid across the bay from San Diego to Coronado to supply government work at North Island with electric lights and electric power and also with telephone service. Applications were made by the San Diego Consolidated Gas & Electric Company and Pacific Telephone & Telegraph Company.

PHOENIX, ARIZ.—Arizona Gas & Electric Company of Nogales has filed application with the state corporation commission, asking for an order authorizing that company to issue first mortgage bonds of \$100,000 par value, the proceeds to be used to pay a portion of the indebtedness incurred in the construction of the present plant, and for additional power unit to cost \$300,000.

PASADENA, CAL.—The city commission has approved the proposed contract with the Southern California Power Company whereby the city of Pasadena will lease the distributing system of the Edison company for a period of two years, with the privilege of buying at the expiration of the contract. If approved by the State Railroad Commission the contract will become effective May 3.

PASADENA, CAL.—A proposed bond election for the purchase of the right of way of the Pasadena Rapid Transit Company is to be delayed until after the war, the city commissioners acting on advice from Washington, which requests that all bond issues be delayed until after the war. Extension of time on the option will be granted by the holding company, with additional provision for allowance of 6 per cent on the amount of bonds and mortgages now outstanding against the holdings, interest to begin May 1, 1918.

YUMA, ARIZ. — Several additions and extensions are contemplated to the municipal electric light, power and water plant: (1) The erection of an electric transmission line, 6600 volts, south and one to the west of town, at present to supply ranches nearby, and to be extended as demanded until they reach some nearby towns; (2) to extend the present secondary network to supply every part of the town, which will need about 1½ miles of line. It is possible that demand for electrical service on these new lines will make it necessary to install a new unit in the power plant. Bids have been received on a 50 horsepower unit. Several petitions for street lamps in various parts of the town which are as yet unlighted are under consideration by the council. Fred Kuecke is superintendent.

THE INTER-MOUNTAIN DISTRICT

MANNVILLE, WYO.—The city authorities of Mannville propose to expend \$20,000 on a new lighting system.

POPLAR, MONT.—The Speed Electric Company has succeeded to the business of the Poplar Electric Light & Power Company.

GENESEE, IDA.—An increase of rates in the village of Genesee has been granted to the Home Telephone Company, Ltd., which serves the town.

SPANISH FORK, UTAH—The Spanish Fork North East Irrigation Company has been incorporated at Spanish Fork, Utah, with a capital stock of \$1800.

BOISE, IDA.—The application before the Public Utilities Commission of the Boise Valley Traction Company for permission to operate one-man cars has been dropped.

HAGERMAN, IDA. — The Idaho Power Company has been granted a franchise for operation in this city, the same having become necessary through the incorporation of the village.

JOPLIN, MONT.—Sufficient signatures have been placed on a petition to practically insure the erection of an electric transmission line by the Montana Power Company to supply electricity in Joplin and other towns in this district.

BOVILL, IDAHO—The installation of a storage battery in the municipal electric light plant this summer is under consideration; also a third wire to cut out the street lamps at will, by the city council. J. L. Shampine is engineer of power station.

MISSOULA, MONT.—The Flathead Independent Telephone Company of Missoula, Mont., is planning to construct lines to connect the following reservation towns with its exchange at Ronan: St. Ignatius, Leon, Moiese, D'Aste, Charlo, Horte and Pablo.

WELLSVILLE, UTAH — The Wellsville City Irrigation Company has been incorporated with a capital stock of \$4140. The incorporators are G. J. Haslam, D. H. Manghan, Wm. J. Allen, R. A. Leishman, H. C. Parker, H. L. Manghan, and Frank C. Grinnell.

BEOWAWA, NEV.—The electric plant of the Beowawa Electric Light Company has been purchased by the Nevada Valleys Power Company, which owns and operates the plant at Battle Mountain. The quipment of the local plant will be transferred to Battle Mountain and installed in the plant there.

LUSK, WYO.—Contract has been awarded by the town of Lusk to the Fairbanks-Morse Company for a 100 horsepower semi-Diesel oil engine and a 60 kva., 60 cycle, three-

phase, 2300 volt generator (directly connected), and a 20 horsepower motor for water works, to be installed in May. L. S. Berry is consulting engineer.

WESTON, UTAH — Application has been made by the citizens of Weston to the Public Utilities Commission for an extension of the service lines of the Utah Power & Light Co. to Weston. The town is at present without electrical service. A five-mile extension of the Utah Company's line would be necessary, the cost of which is estimated at \$16,000.

BOISE, IDAHO — The reorganization committee of the Northern Idaho and Montana Power Company has issued a letter to holders of certificates of deposit, stating that the securities of the Mountain States Power Company have been issued and deposited with the Continental & Commercial Trust and Savings Bank of Chicago for distribution.

HELPER, UTAH—Application has been filed with the state engineer by G. R. Corey of Salt Lake City for permission to use 125 second feet of water from Price River to develop 1600 electrical horsepower. The proposed plant will be located within a few miles of Helper. The plans provide for the construction of a concrete dam 3 feet high and 40 feet long, the water to be carried in a ditch for a distance of 1½ miles, passing through two 4 foot wheels under an 85 foot head.

CALIFORNIA STATE WATER COMMISSION NOTES

WHEATLAND, CAL.—Plummer Enochs and B. F. Enochs of Wheatland have been granted 2.32 second feet of Bear river tributary to Feather river in Sutter county, for the irrigation of 201 acres by means of two 10 inch pumps, at a cost of \$2000.

EUREKA, CAL.—Gertrude B. Francis of Ferndale has been granted 1 second foot of the waters of Harris creek, tributary to Mattole river in Humboldt county, for the generation of electricity for ranch purposes, the water to be returned to the stream after use.

YOLO, CAL.—Reclamation District No. 108 in Yolo and Colusa counties has been granted 500 cubic feet per second of the waters of the Sacramento river for the irrigation of 58,100 acres. The main canal is 16 miles in length and the estimated cost of the diversion is \$75,000.

WILLETS, CAL.—Mrs. A. M. Faxon and Mrs. Hazel Montague have been allowed 20 second feet of Sacramento river in Colusa county for the irrigation of 1200 acres. The diversion is to be by means of an 18 inch centrifugal pump connected to a 75 horsepower motor, and the estimated cost of the work is \$8,800.

LASSEN, CAL.—Pierre Ducasse of Termo has been allowed 1435 acre feet of Schotte Canyon, Ducasse Ravine and Antelope Creek in Lassen county for the irrigation of 496 acres. The works consist of an earthen dam 30 feet high, 1700 feet long on top and 600 feet long on the bottom, and a main ditch 4416 feet long. The estimated cost of the diversion is \$12,000.

STONYFORD, CAL.—Fred Laux, Jr., of Stonyford, has applied for 1.43/80 second feet of Stony Creek, tributary to the Sacramento river, in Colusa county, for the irrigation of 123 acres, no water to be diverted during the period from June to and including November of each year. The water is to be raised by a pumping plant into a ditch which conducts the water a mile to the land to be watered.

SAN FRANCISCO, CAL.—Tisdale Irrigation & Drainage Company of San Francisco has been granted their application for 29¼ second feet of Sacramento river in Sutter county for irrigation on 2339 acres. The water is diverted by means of two pumping plants. What is known as the upper unit consists of an 18-inch double centrifugal pump operated by a 75 horsepower gas engine, while a lower unit is composed of a 12 inch pump operated by a 40 horsepower engine. The main ditch of the upper unit is 2½ miles in length and of the lower unit 1 mile. The permittee is a mutual irrigation company.

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JOURNAL OF ELECTRICITY

VOL. 40 NO. 10

SAN FRANCISCO, MAY 15, 1918

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, MAY 15, 1918

NUMBER 10

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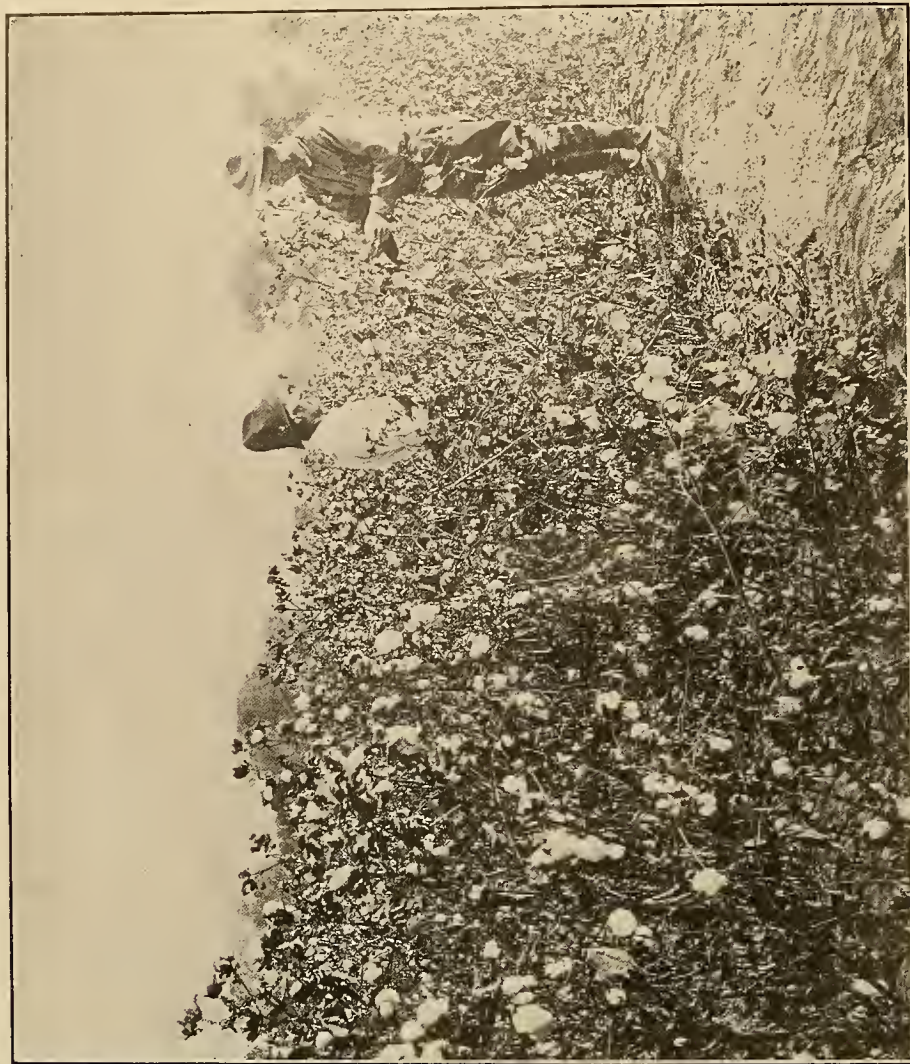
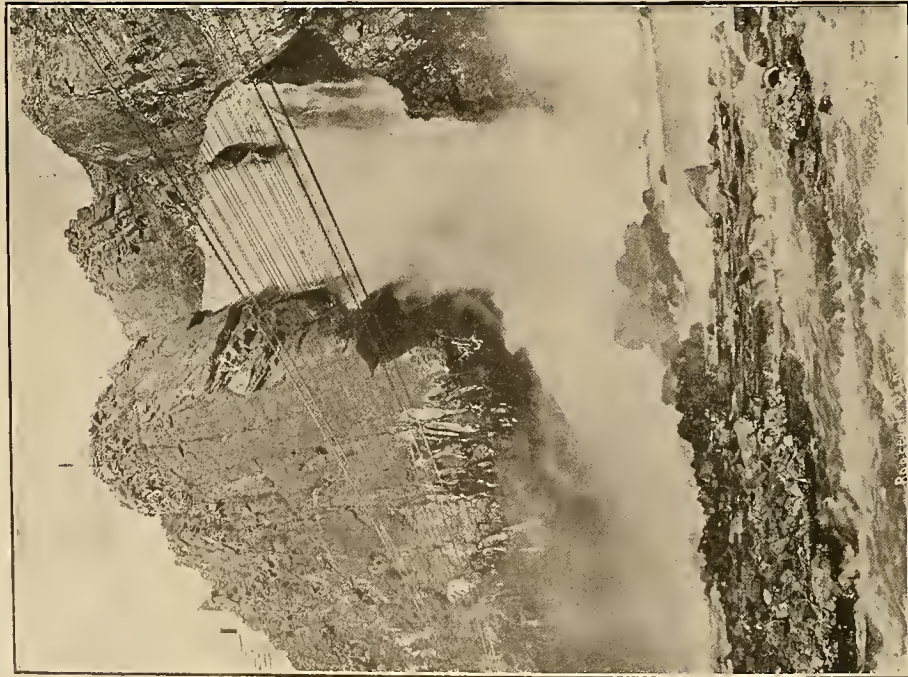
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HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—XI

Thirty thousand acres in cotton, which produced a field valued at \$5,000,000 during 1917, is a single forceful instance in the West of where hydro-electric energy is aiding in winning the world war. The cotton fields of the Salt River Valley, in Arizona, shown in the illustration, fed by the giant Roosevelt dam—the second largest impounded waters in the world—together with the hydro-electric supply thus made available, beautifully typify the new West and its present service to the nation. The yield in cotton, which is as high as 500 pounds per acre and of excellent quality, points emphatically to the war service of electrical energy in all other agricultural districts of the West, where one commonwealth last year produced through the aid of electrical energy the enormous total of a billion dollars in agricultural products.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, MAY 15, 1918

Number 10

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THE AMAZING MATHEMATICS OF GOSSIP

FEW seem to realize the enormous propagating power of gossip. Let us for a moment do some simple arithmetic. It is safe to say that 98 per cent of America's hundred million souls talk to at least five different persons a day. It is likewise safe to say that within at least twelve days, 98 per cent of the population can be reached by personal travel. Then it follows, by one person communicating a piece of gossip to five others and the next day each of these five communicating this gossip to five others, and so continuing this process but for twelve days, that almost a quarter of a billion human souls can be influenced—or a population two and one half that of the United States.

While, of course, much of the propagating power of gossip loses itself in conversation with those who have "heard the news," yet in view of the amazing possibilities of its baleful influence, let each loyal citizen resolve to down the gossip that weakens our cause, and in its place spread the win-the-war spirit everywhere.

Much had been hoped for at the Del Monte conventions, but few anticipated the wonderful extent to which war service ideals would be crystalized at the various sessions. Some months back, President Wilson announced to the world the fourteen fundamental points necessary for all peoples and nations to agree upon before world peace could become an assured reality. First and foremost among these he emphasized the necessity for open and above-board discussion at all times and places.

And so it is not surprising that the keynote of the great Del Monte conventions proved also to be a protest against the closed, secret meeting in the industry, and a plea for the open discussion at all times.

The West has ever proven itself to be the foremost leader in advanced thinking along lines of mutual helpfulness. The open meetings at Del Monte, in which central station manager, representatives of the Railroad Commission, operating engineer, contractor-dealer, jobber and manufacturer vied with each other in expression of how the industry can better serve the nation by building up within itself a fuller, more harmonious working organization, fully justified the best traditions of the West.

The Del Monte conventions will go down in history as a splendid expression of war service ideals in utility life and an emphatic protest against the closed meeting in future affairs of the industry.

In the coming months much is expected of the electrical industry. The whole world thought in its present state of flux is susceptible of molding and casting into channels of activity that will make for a better, more cheerful place in which to live. Is it too much to hope that the wholesome Del Monte conventions may have a part, no matter how small, in this great work?

The wide publicity that is being given to the very intensive discussion of the necessity for new water power legislation and development that has appeared in recent issues of the Journal of Electricity is beginning to net results.

This editorial matter, reaching as it does practically every phase of national engineering and industrial life, and breathing the potential possibilities of the great water power resources of the nation, from a publication that speaks from a viewpoint of thirty-one years of service to the nation, bears upon its face the conviction of sincerity. The able specialists and public spirited men who have contributed these articles make this array of facts all convincing.

It is gratifying to note that the utility organizations themselves are throughout the West aiding in disseminating this authoritative data.

For further intensive spreading of this discussion, the following constitute some of the more important matter on this important subject that has appeared in the columns of the Journal of Electricity since the first of the year.

Editorials—

The Crisis in the Power Situation—January 1, 1918.
The Journal and Water Power Legislation—January 15, 1918.

After-the-War Value of War Service—February 1, 1918.

The Super Power Stations—March 15, 1918.
Water Power Taxation—April 1, 1918.

Editorial Articles—

Initiative and Effort in Peace and War; by F. G. Baum—January 1, 1918.

Frontispiece—Showing war necessity for new power development—January 15, 1918

- Frontispiece—Showing how water power is helping to win the war—February 1, 1918.
- War Service of Electrical Energy; by Robert Sibley—February 1, 1918.
(A pictorial review of 25 pages.)
- Frontispiece—Showing war value of hydro energy—February 15, 1918.
- Front Cover — Showing President Wilson's water power letter—March 15, 1918.
- Interconnection and Power Development; by P. M. Downing—March 15, 1918.
- Some Reasons Why Water Power Development Has Ceased; by John A. Britton—March 15, 1918.
- War Time Public Utility Problems; by Max Thelen—March 15, 1918.
- Water Resources of Southern California; by H. A. Barre—April 1, 1918.

Not only the publicity departments of the great utility companies in the West would do well to see to it that this valuable and authoritative data be given an even greater dissemination throughout the length and breadth of the nation, but every man of the electrical industry should exert his individual influence in saying a good word for the movement which means so much for the welfare of our nation and for the future prosperity of the great West.

The British ministry of reconstruction has just published a complete list of the various commissions and committees that have been set up, both within that ministry and within other ministries and departments of the British Government, to deal with questions which will arise at the close of the war.

Readjustments in engineering and commercial affairs will shake the entire world upon conclusion of peace. The great Pan-Pacific area offers perhaps one of the greatest fields of opportunity for future development and in the rehabilitation of world affairs the countries washed by the waters of the Pacific will undoubtedly go ahead by leaps and bounds in commercial and engineering development.

We should at this time prepare, as our British cousins are doing, to meet these new conditions by appointing proper commissions to study these problems, especially those relating to the engineering trades.

Such study might, for instance, include the compiling of a list of the articles suitable for manufacture by those with engineering trade experience or plant, which were either not made in the United States before the war, but were imported, or were made in the United States in small or insufficient quantities, and for which there is likely to be a considerable demand after the war, classified as to whether they are capable of being made by (1) women, (2) men and women, or (3) skilled men; and setting out the industries to which such new manufactures would most suitably be attached; and to make recommendations (a) on the establishment and development of such industries by the transfer of labor, machines, and otherwise; (b) as to how such a transfer could be made, and what organization would be requisite for the purpose, with due regard to securing the co-operation of labor.

There should also be board of trade committees on the coal, electrical engineering, iron and steel, non-ferrous metal, and textile trades, and on the shipping and shipbuilding industries, to consider the position of these trades and industries after the war, with special reference to international competition, and to report what measures, if any, are necessary or desirable to safeguard that position.

Such timely foresight in the getting under way of these new investigations would mean an after-the-war preparedness for which the next generation would undoubtedly never cease to bless us.

Impairment of hydro-electric service in the West would indeed prove almost a calamity, so interwoven has become the application of electrical energy with the industrial and agricultural activity of this section of the nation.

In order that no permanent set may take place that would impair this service, these utilities must be kept in the same high state of maintenance and operation that has characterized their development thus far.

To accomplish this money must be supplied for needed extensions and able men must be kept in the executive and engineering staffs of these organizations.

Neglect of these two factors—the supply of money for needed up-keep and the supply of able men for operation—has given to the world a sad illustration in the recent events that have been transpiring in Russia.

The latest mail advices from Petrograd on the fuel crisis, according to the London Electric Review, say the scarcity of fuel becomes more felt day by day. The electric lighting stations work intermittently, and unexpected interruptions in the lighting are common occurrences. The publication of newspapers is seriously delayed owing to the shortage of current. A number of business concerns, particularly small ones, experience great difficulties for the same reason, while the street railways are reduced to running short time, and look as if they will stop completely. The town water system is also seriously threatened through fuel scarcity.

The stoppage of the street railway traffic in Petrograd is the result not only of insufficient fuel, but serious damage at the central station. One of the two new large turbines of the station not long ago got out of order, says the Nash Vyek, and it could not be put right by the present tramway board, in which there is not a single experienced engineer. Application had to be made to some private firms, but whether they understood the work is not yet quite clear. The tramways council of management, consisting only of workmen and controllers, are probably beginning to understand that without a scientifically trained staff it will be difficult to run the business. Anyhow, the council is now trying to engage engineers.

Such pitiful forewarnings as these should seem to give striking emphasis to recent utterances by the executive authorities at Washington looking toward supplying the necessary financial backing to see to it that American utilities be kept at their maximum of efficiency in operation and development.

It is almost beyond comprehension to fully grasp what the giant shipbuilding program now under way in Pacific Coast ports means for the future. Within the next eighteen months some five hundred ships are to be put into the merchant marine service from this section of the nation.

The Intensive Training of Seamen

Mere figures of course indicate nothing, and are wholly meaningless until careful analysis is made. In the manning of the new merchant marine the electrical and mechanical engineering professions will be called upon to give yeoman service not only in the present meaning of the word, but in the old English distinction of faithful and loyal service to a cause.

A census of fifteen vessels now plying out of a Pacific Coast port shows that of 500 men 16 per cent are American born, 28 per cent naturalized, and 56 per cent aliens. This is a ghastly state of affairs to look square in the face in these days of necessity.

The Sea Service Bureau of the Recruiting Service of the U. S. Shipping Board have worked out some excellent plans for bettering immediately this unfortunate state of affairs. Nationwide publicity will soon be available which will set forth details of the plans for properly training and employing the thousands upon thousands of American-born men for the new life on the sea under conditions of pay and daily living that should appeal to the American youth.

The men desired are of the draft age and are to be exempt from the draft so long as they are in the merchant marine service. The entire matter is deserving of the most careful consideration of all American citizens, but men of the electrical industry in the West should be giving the matter unusually careful weighing, for the ever increasing electrical applications aboard ship mean an increased responsibility for the proper placing of efficient men.

Statistics just available from the Department of Commerce at Washington on the growth of commerce in the great Pacific area, are most interesting. For many months past the editorial columns of the Journal of Electricity have called the attention of its readers to the growing possibilities of increasing the commercial and engineering relation of the countries that border the Pacific Ocean. That these relations are growing by leaps and bounds is forcefully seen from a casual glance at comparative statistics for the eight months ending February, 1918, in opposition to those covering the eight month period ending February, 1917.

In the eight month period ending in 1918, imports increased by nearly \$300,000,000, amounting to the grand total of \$1,841,316,000. Exports, on the other hand, decreased by over \$200,000,000.

Growth of Commerce in the Pan-Pacific

In brief, these statistics are as follows:

IMPORTS FROM: Grand Divisions—	Eight Months Ended February	
	1918	1917
Europe	\$ 284,094,652	\$ 300,055,430
North America	553,583,928	425,504,060
South America	370,517,124	312,496,929
Asia	514,135,374	350,087,126
Oceania	77,858,069	37,194,985
Africa	41,126,943	32,473,447
Total	\$1,841,316,090	\$1,547,811,977
EXPORTS TO: Grand Divisions—	Eight Months Ended February	
	1918	1917
Europe	\$2,434,317,494	\$2,877,556,031
North America	774,609,845	687,599,487
South America	222,255,989	101,417,634
Asia	310,421,570	244,101,320
Oceania	83,919,225	73,687,210
Africa	37,824,104	38,631,864
Total	\$3,863,348,227	\$4,082,993,546

It is interesting to note that our commercial relations with Canada to the North and Asia in the far East have virtually increased to such gigantic totals as to make the Pan-Pacific area hold practically the balance of trade in the new commercial readjustment due to the present critical times.

Among the countries taking American products, statistics show that the greatest expansion is in the case of Japan, which took nearly a hundred million dollars more of American products than in the corresponding eight months of 1917. The greatest drop, on the other hand, was in the exports to European Russia, which were about two hundred million dollars less.

These figures point conclusively to the growing commercial and engineering possibilities of the West. As to the important part that electrical machinery and apparatus is taking in this new commercial upbuilding, statistics from governmental experts now in the Orient investigating this matter will be available in the columns of the Journal of Electricity within the next six weeks.

It has been brought to our attention by several prominent electrical contractor-dealers that it would be a great help to them to have all manufacturers of outlet boxes standardize on the screws used in ears of the boxes. Also it is pointed out that the screws now furnished are so short as to be of no use whatsoever. The best size for use for all purposes would be a one-inch, No. 10, 24-thread, which is a standard machine screw.

The many porcelain receptacles and rosettes now installed by the contractor on outlet boxes makes it necessary to use a longer screw in nearly all cases. At the present time, the manufacturers are using three sizes of screws.

We feel this to be an interesting subject to take up with both the contractor-dealer and the manufacturer, and as a consequence, the Journal of Electricity hereby invites a discussion on this timely problem from all those interested in its solution.

NEW JOURNAL SERVICE: Electricity and its uses for summer months will be featured in the issue of the Journal of Electricity for June 1, 1918. Interesting articles setting forth the application of fan motors, refrigerating machines and cold storage plants, together with other important uses of electrical energy in summer months, will be depicted by experts along each particular line. This is the first instance wherein effective progress in the West in this important phase of the electrical contractor-dealer's activities has been featured in technical journalism. In the issue of June 15, 1918, the increasing engineering and commercial opportunities in the Far east with reference to America, will be featured for the first time in American technical journalism.

ELECTRICITY IN THE SALT RIVER VALLEY

BY HARRY A. WELSH

(Copper and foodstuffs—essentials in war service—are both dependent upon the electrical energy generated at the Roosevelt Dam in their production. In the irrigation of the great cotton and agricultural belt of the Salt River Valley, the water serves a double purpose, first of providing the power for pumping and then itself bringing life-giving moisture to the desert. Eighteen thousand tons of copper daily and over four and a half million pounds of cotton in a year are no mean contribution to the war needs of the nation—and this record may be counted in large part as a record of electricity's service.—The Editor.)



Roosevelt Lake, where the water is stored

THE importance of electricity in war times in the Salt River Valley may be best understood, perhaps, by the statement that there have been no lightless nights in any of the towns of the Salt River Valley. Neither has any manufacturing enterprise been obliged to close on Mondays because of the necessity of saving fuel, for practically all light and power are derived from the water from the Roosevelt Reservoir.

In response to the question, "How is the electricity generated from the Roosevelt Project being used to help win the war?" Walter R. Elliott, project manager of the Salt River Valley Water Users' Association, said: "Ninety per cent of the energy developed by the water used for irrigating the lands of the Salt River Valley is utilized directly or indirectly in increasing the production of war necessities."

The water as it is released from the great Roosevelt Reservoir, sixty miles above the Salt River Valley, develops 11,000 kilowatts; 8000 kilowatts is trans-

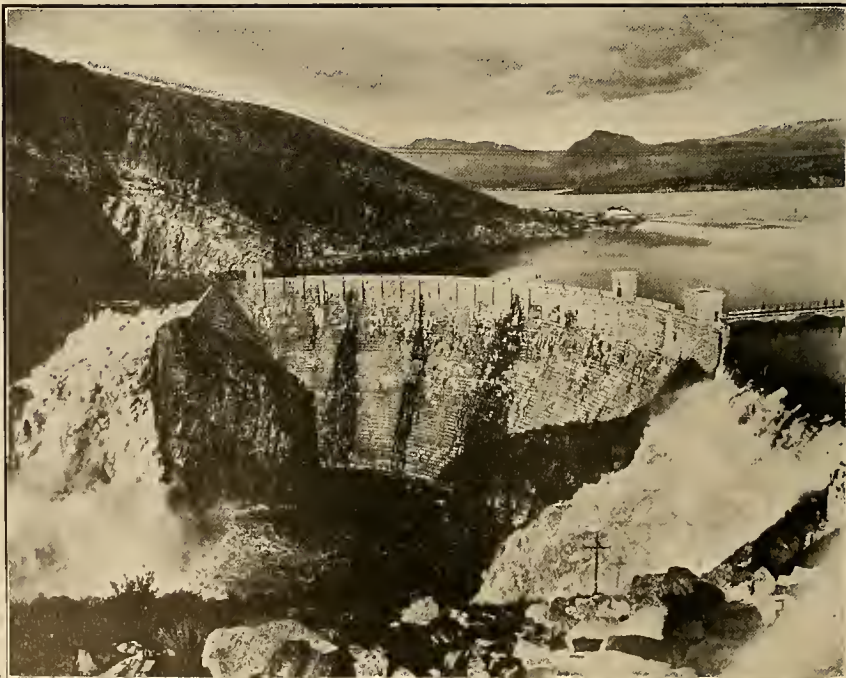
mitted to the Inspiration copper mines at Miami, and 600 kilowatts to the Magma mines at Superior. The balance is transmitted to Phoenix for lifting water for irrigation, for light and for power. In addition to the power developed at the reservoir, there are three power houses located on the canals, which develop a total of 8000 kilowatts. The largest, and also the most beneficial, use of this water is in pumping water to irrigate additional acreages. In this way the water is made to do double duty: First, developing electric power which is transmitted to lands of higher elevation, and there to operate pumps for irrigating more land.

The total amount of land which is thus reclaimed from the desert, and is now producing, is approximately 34,500 acres; this, of course, in addition to the 240,000 acres watered by gravity ditches. It is true that water is developed from other sources to some extent for these lands, but the fact that is of most importance is that this area of 34,500 acres would be, as it was for unnumbered centuries, a desert waste, were it not for the hydro-electric power developed from the Roosevelt Dam.

The Roosevelt Dam, impounding the water of the Salt River and Tonto Creek, was built into the solid rock of the mountains just below the junction of the two above mentioned streams, and about 80 miles from the city of Phoenix.

The dam is situated just at the head of a narrow canyon. Back of the dam, and forming the reservoir site, is a natural basin, an ideal location for the great reservoir. The dam is 284 feet high and 168 feet thick

The Roosevelt Dam was completed February 5, 1911, and dedicated by Theodore Roosevelt on March 18, 1911. Of course, a large portion of the area irrigated from this stored water is reached by gravity ditches, but 34,500 acres of desert land are dependent on electric pumps for their water supply. Some 8000 kilowatts is further transmitted from the power plants at the dam to the great copper mines at Miami to help supply this war necessity for the government.





RAISED ON ELECTRICALLY IRRIGATED LAND

Dates, alfalfa, corn and lettuce, grown on the desert through the stimulus of water. How large a contribution to the food supply of the nation is made by this fruitful country may be judged from the table given below.

at the base, built into the solid bedrock of the stream to a depth of 36 feet, and embedded in the solid mountain walls, on either side.

The reservoir forms a lake $25\frac{1}{2}$ square miles in area, and holds the waters drained from an area of 7500 square miles. It holds water sufficient to water 1,367,305 acres, one foot deep, or enough to furnish a constant supply of water for the 240,000 acres under the irrigation project for a period of three years.

The water has made possible the growing of:

285,030 tons of alfalfa.
13,000 lbs. of alfalfa seed.
4,642 tons of grain, hay.
33,318 cwt. of Indian corn.
5,362 tons of corn, fodder.
28,018 tons of corn, sorghum.
79 tons of corn, broom.
172 tons of cane, sugar.
153,606 cwt. of barley.
53,123 cwt. of wheat.
15,759 cwt. of oats.
4,688,900 lbs. of cotton, long.
5,861 tons of cotton seed.
80,522 crates of oranges, navel.
3,150 crates of oranges, Valencia.
7,506 crates of grapefruit.
464,580 lbs. of olives.
2,046,500 lbs. of apricots.
3,336,760 lbs. of peaches.
118,733 lbs. of pears.
264,750 lbs. of grapes.
76,875 crates of small fruits.
435,862 crates of cantaloupes.
2,217,800 lbs. of watermelons.
29,300 crates of lettuce.
21,375 cwt. of beans.
22,380 cwt. of potatoes, Irish.
8,250 cwt. of potatoes, sweet.

The production of 10,000,000 pounds of butterfat, 40,000 tons of beef, 3000 tons of pork, 600,000 cases of eggs, besides uncounted thousands of pounds of poultry of all kinds.

amount to the food of the country.

No metal is of more importance in war than copper, and the hydro-electric power developed by the water has made possible the operation of the Inspiration Consolidated Copper Company, one of the largest



CEMENT-LINED CANAL

11,000 kw. is developed at the reservoir and in addition three power houses are located on the canals which develop a total of 8000 kw. The largest use of this power is for irrigation pumping.

producing mines of the state. This mine produces 12,000,000 pounds of copper a month.

The Water Users' Association is planning even greater things for the future. A contract has already been let for an additional power plant which will double the electric energy furnished to the Magma mine. Plans are well under way for extending the present power plant which will develop power for pumping water to 30,000 acres of desert land, adding that much more to the food production of the country.

GIANT MAGNET IN USE TO HANDLE MATERIAL IN SHOPS AT OGDEN

A huge steel magnet is being used in the Southern Pacific shops at Ogden for the purpose of loading and unloading scrap at the scrap docks and unloading and handling castings to and from cars about the shop grounds. The magnet is applied to a self-propelling crane equipped with a 40-foot boom. The magnet has a lifting capacity of approximately 44,000 pounds when applied to material such as a slab with a smooth surface.



ADMINISTRATION BUILDING

The Water Users' Association has already let a contract for an additional power plant, and is to extend the present plant to develop power for pumping water to 30,000 more acres of arid land.

The water, too, has made possible the growing of hundreds of home gardens which have added no small

PEAK LOADS UNDER DAYLIGHT SAVING

BY C. A. ANDREWS

(From the data which have already accumulated in regard to the effect of Daylight Saving, it is possible to predict with some accuracy the year's result. The interesting problem, of course, is how the business, the lighting, and the domestic load will overlap under the new arrangement. In this article by a man who is connected with the engineering section of the city lighting department of Seattle, an analysis of the general load into its component factors has been made and these shifted as necessary under the change in time. The result is a very interesting series of curves for comparison.—The Editor.)

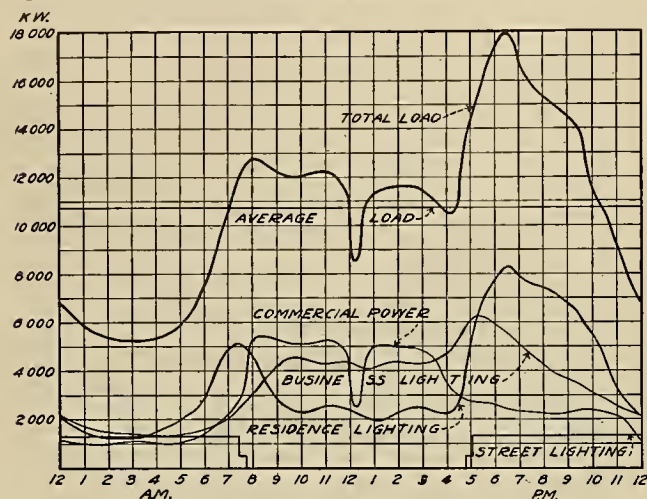
The analysis of the load conditions of large metropolitan power systems presents a problem of interest from various viewpoints. In the study of rate making, building up of load, improvement of load factor, the effect of the daylight saving law and other factors, the method of analysis herewith presented may prove to be of value to power producers.

While each case of load study will undoubtedly present its own individual peculiarities, the general principle involved in the accompanying method is capable of rather widespread application. Much desir-

For each of the curve forms determined in this manner an average load was then found. The sum of these four averages as thus found would not, of course, be equal to the average for the total load on the system, since the four curve forms represented only a fraction of the total load.

The thing desired, however, was that the sum of these four averages should equal the average of the whole load, and to determine the relative height of each average, and consequently each curve form, so that the four curves, when added, would give the real load curve of the entire system, recourse was had to the total amount of kilowatt hours sold in each class of business, as shown on the readings of customers' meters. The period of time covered by this study was for the month of January, 1918, and the total kilowatt hours sold in each class of business during the month, divided by 744, the number of hours in the month, gave the average load in each class of business, as at customers' meters. Assuming that the total losses between the station distribution buses and the customers' meters to be divided proportionately to the amount of power delivered to each class of consumers, the average load distributed from the buses to each class was assumed to be the same percentage of the total amount distributed as each class average at the customers' meters.

Thus the average load at the buses was divided into four parts, in proportion to the sales in each class, and each part thus found, when divided by its respec-



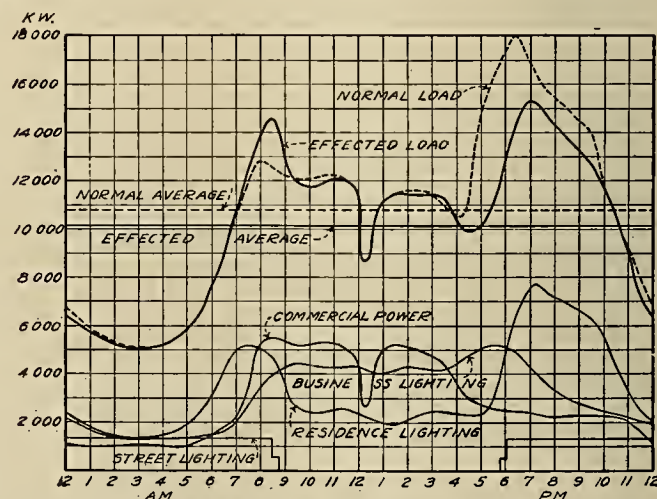
THE AVERAGE DAILY LOAD UNDER TRUE TIME

The curve types were obtained from instrument readings on feeders devoted exclusively to each class. The proportional load heights were figured from the kilowatt hours sold in each class of business.

able research work has been done in connection with individual cases of many different classes of power applications. Load curve forms have been presented for a multitude of classes, each being considered as an individual case, but the aggregate of all these classes that are usually found connected to any large power system offer an interesting field for study.

Power consumers may be grouped in classes in many different combinations, but for the purpose of illustration, the load on a power system in a Western city is here divided into the following four factors: Commercial power, which includes, in general, all classes of motor applications; business lighting, including stores, theatres, hotels and office buildings; residence lighting, including electric ranges and other miscellaneous household devices; and street lighting. In this case only the street lighting load curve could be determined directly from instrument readings in the stations, the other three classes of load being supplied, in part, from identical feeders.

A sufficient number of feeders, however, were given over to each single class of consumers, so that at least the curve form of each class was readily determined from station readings by plotting the combined loads on the feeder supplying each kind of load.



THE EFFECT OF DAYLIGHT SAVING

The effect of commencing the day an hour earlier has here been plotted for each class of business and the total daily load compared to that before the application of Daylight Saving.

tive average found from the original curve forms, gave a factor by which its respective curve form must be expanded to bring the curve to a true representation of the total load in its class. When this was done and each of the four expanded curves plotted together and added, their sum gave a curve of total load which

coincides with the actual average curve for the month with remarkable accuracy.

The fact that a total load curve as calculated in this manner might not exactly coincide with the actual average curve may be due to one or more of several factors, involving accuracy of customers' meters, and the time of their reading, as compared to station meters, correctness of curve form in each class, etc., the latter being the most probable source of error.

The accompanying curve, Fig. 1, shows the total load and its four factors as determined in the manner herein outlined, while Fig. 2 shows the application of the method to the study of the effect of the daylight saving law if applied the year around. In this case, the clocks having been set one hour ahead, the street lighting load and the power load are seen to overlap in the morning, whereas before "spiking the clocks" this did not occur. These two curves would undoubtedly undergo no change in form due to the law and consequently were plotted in exactly the same shape as before, but with the street lighting load shifted to conform to the hours of dark and daylight. The form of the residence and business curves have been slightly altered in this illustration.

The net effect of keeping the clocks an hour ahead throughout the year is seen to produce an improved load factor and a reduction of kilowatt hour output. For the period here illustrated, the average load is decreased from 10,750 kw. to 10,125 kw., the peak is decreased from 18,000 kw. to 15,300 kw., the daily kilo-

watt-hour output is decreased from 258,000 kwh. to 243,000 kwh., while the load factor increases from 59.7 per cent to 66.6 per cent.

In plotting the individual curve forms as first approximated and totaling this assumed consumption, the resultant curve was found to coincide with the actual average at all hours except between 8 a. m. and 4 p. m. The maximum variation during this time was 7 per cent in excess of the actual average. This was reduced by a slight variation of the individual curve forms.

MARKET FOR SMALL ELECTRIC MOTORS IN INDIA

The Indian Textile Journal expresses surprise that no foreign firm has yet thought it worth while to open up in Bombay a demonstration of electric motors for miscellaneous industrial purposes, including small cotton and grist mills, printing presses, elevators, and brass and woodworking machinery. It voices the opinion that the local producers of electric current would be interested and glad to co-operate with such a project, if promoted on the ground. Motors of medium grade and cost would probably be best suited to the market. Hitherto the United States has not had a very large share of the Indian trade in electrical accessories, except in the line of fans, but the war has changed conditions materially and previous sources of supply have been largely cut off.

SAN DIEGO-EL CENTRO TOLL LINE

(This last year of war has witnessed many remarkable feats accomplished by individuals and by companies because the government asked it as a war service. This record of a telephone line built under difficulties over mountains and desert is not the least romantic of the accomplishments. The data is made available through the courtesy of the Pacific Telephone & Telegraph Company.—The Editor.)

The United States government, through Col. W. E. Wilder, in command of the Third District, with headquarters at Los Angeles, recently made a request for a telephone line from San Diego, Cal., to El Centro, Cal., a distance of 123 miles, with stations at Campo and Tecate, where government military camps are located.

A few days later the construction department of the Southern Division had part of the material necessary for the work and the men to do it, on the job. Work was begun at San Diego, with only a small part of the material in sight. The balance of the material, which in all consisted of 3990 poles, 17 tons of copper wire, 500 anchors and a large quantity of miscellaneous material, was secured and shipped to San Diego, Cam-



ACROSS THE DESERT

A long stretch of the line was laid across the desert where the sand was so dry that it filled the holes as fast as they were made, and the sun so hot that metal instruments had to be handled with heavy gloves.

po, Dixieland and El Centro, from which points it was hauled by motor truck and unloaded as near to the line as it was possible to go by road, which in some

places was over two miles away and seldom nearer than 200 feet. This is where the "Missouri thoroughbreds" and burros did their bit, and for many miles the brush was so thick through the mountains that the men had to crawl on their hands and knees and pull the poles and material after them. It was even necessary in some places to cut trails through.

For the first 82 miles out of San Diego the line was built through the mountains, and as it was sometimes impossible to get right of way on property over which it would have been advantageous to pass, for half this distance the line was built through brush as described above. The other half was through barren, rocky country, in 21 miles of which the poles were set in solid rock, after having been lowered down steep and rugged mountain sides and carried up again on the opposite side of a river bed over high hills of rocks to the line where the holes were blasted with dynamite.

At the bottom of the Mountain Springs grade the mountains and desert meet. There is a concrete bridge at this point connecting the mountain road with the concrete road leading over the desert to El Centro. For the next 23 miles the poles were set in sand, although the digging was easier which permitted the use of the pole hole digging machine. Considerable difficulty was experienced in keeping the sand from falling in and filling up the hole before the pole could be set

on account of exceptional dryness. These 23 miles of holes were dug by the machine in eight days, but the heat was so intense (averaging 120 degrees) that a single shift of men could work only a few hours at a time and they had to wear heavy leather gloves in order to handle the wires and tools, as they were too hot to be touched with the bare hands.

The sun was so hot that it warped the concrete road in several places, making bumps six inches high.

Just thirty days after the work was commenced, the line was completed into El Centro, making a total of 105 miles of toll line constructed and seven miles of wire strung on existing poles between Seeley and El Centro and 11 miles between La Mesa and San Diego.

A total of 3990 poles were set, averaging 133 poles each day with two outfits. Heretofore the feat of Captain G. F. Price of the United States Army, when he built a telegraph line from San Diego to Tucson in 1873 in four sections, and setting a total of 93 poles each day, was considered wonderful. The Pacific Telephone & Telegraph Company, with half the number of outfits, set 133 poles each day, which was 40 more poles than set daily by Captain Price.

Captain Price set 17 4x4x18-ft. square poles to the mile, strung 1 wire and averaged $5\frac{1}{2}$ miles a day. The Pacific Telephone & Telegraph Company set 38 poles to the mile, strung 2 wires and averaged $3\frac{1}{2}$ miles a day, using 4x6x20-ft. square poles, also 925 25-ft. and 30-ft. round poles on corners and road cross-

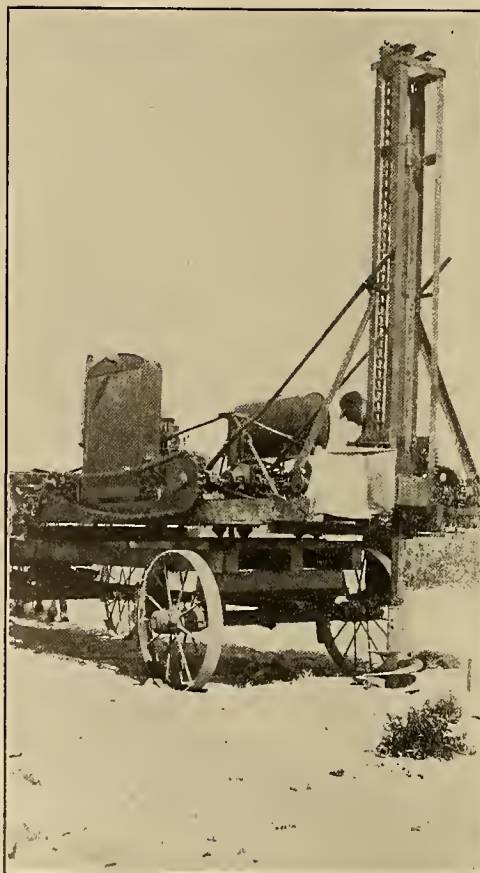
ings. Approximately 500 anchor guys were placed on the line. Notwithstanding the fact that the telephone company built its line according to standard specification, heavy enough to carry a ten-pin arm lead with a present and ultimate capacity of 2 and 10 wires respectively, enough poles were set each day to cover a distance of 7.8 miles, had they been strung out at the rate of 17 to the mile instead of 38, thus actually building 2.3 miles more actual toll line, with half the number of outfits, than Captain Price.

Considering the great difficulties involved in the construction through mountain and desert, and the fact that the work was done well within the estimates for labor and incidentals, it is an achievement that telephone men will do well to emulate.



THROUGH THE MOUNTAINS

For twenty-one miles, the poles had to be set in solid rock. Often the poles had to be carefully lowered down steep mountain sides and then carried up again on the opposite side of some rocky river bed.



POLE-HOLE DIGGING MACHINE

In many places through the mountains the holes had to be blasted with dynamite, but wherever possible the drill was used.

RECENT ADVANCES IN WESTERN WATER LAW

(The lack of clearly worded and comprehensive laws covering questions of water rights has been one of the most difficult and discouraging features of water power and irrigation development in the West. The Water Code of Oregon, adopted in 1909, is generally looked upon as one of the most progressive steps which has yet been taken to remedy that situation. A survey of present conditions there, with a summary of the laws which govern riparian rights in that state, is here given by the Oregon state engineer, as presented recently before the Idaho Irrigation Congress.—The Editor.)

THE OREGON SYSTEM

BY JOHN H. LEWIS

It is generally conceded that certain fundamental information must be gathered at public expense and made available as a basis for the sound development of the public water resources in the arid and semi-arid states of the West. Here land is of little value without water. The well-known system of public land surveys, and of land titles, is of relatively small value in the planning for financing a large irrigation or water power project in comparison with the more difficult water right and water supply problems.

No longer will the capitalist rely upon water supply estimates based upon precipitation records. He must have actual measurements of stream flow in the vicinity of the proposed diversions. If a large project is in contemplation and the water supply is limited, daily stream flow records extending over one to ten years must be available. If these records are not available, capital will as a rule go to those states having such records. In addition to this, reliable information must be had as to the extent of prior rights on the stream, so as to determine the amount of surplus water which is available for the new project. Here again the tendency will be for capital to go to the state having definite water right records.

Even with this information furnished at public expense, it is still a matter of considerable expense to prepare plans, and estimates of cost for a large project so that the cost per acre, or horsepower for development, may be known and its feasibility determined. Few promoters can finance such an investigation and then it is undertaken only in the hope of making enormous profits. Oregon has gone beyond most states in preparing plans and estimates of cost for the benefit of land owners and we should in the near future, see the development of many of our large projects. The state has in a measure taken the place of the promoter, so that the people residing on the land may be saved from heavy promotion expenses. Where there are several alternate schemes for the development of a valley, it is found that the people place considerable confidence in these reports.

Oregon's Program

The State of Oregon has laid a solid foundation for the development of its water resources during the twelve years since the creation of the office of state engineer.

During this period the state and the U. S. Geological Survey have been co-operating upon the dollar for dollar basis in determining the amount and seasonal fluctuation of the water in our streams. All water supply information has been summarized and published for convenient reference by those interested.

We have also expended a considerable sum of money in determining how much of the public water supply has already been put to beneficial use, so that the amount of surplus water may be known. These records can be readily consulted at the central office at Salem.

We have expended \$65,000 and the U. S. Reclamation Service has expended about \$100,000 in co-operation with us in the preparation of plans and estimates of cost for the irrigation of twelve large projects embracing 795,000 acres, at an estimated cost of \$41,794,000 dollars, and for the development of about two million horsepower. These reports are furnished to owners of land under the various projects. They form a reliable basis for organizing for construction.

Laws have been provided, whereby definite rights to unappropriated waters can be initiated, and these rights protected during the construction period.

Oregon's Water Code

In 1909, Oregon adopted a water code, which has since been accepted as a model for similar legislation in a number of Western states. This law has been interpreted by various state and federal courts, and its constitutionality upheld by the Supreme Court of the United States.

The water code declares all waters within the state from all sources of supply to be property of the public. Definite administrative machinery is provided to regulate the use of this property in the interest of the public, and for the protection of vested rights. This regulation is possible under the police power of the state.

A board of which the state engineer is chairman was created to have charge of this property.

It is the duty of this board:

(1) To ascertain and record all rights to use of this public property which had become vested prior to the adoption of the law.

(2) To grant rights, for beneficial use in the state's unappropriated waters, to those who may initiate rights subsequent to the adoption of this law.

(3) To protect all recorded rights, to the use of public waters by regulating diversions from streams.

This law has given general satisfaction to the irrigation and water power interests, also to promoters of new enterprises, and the public generally. Water power interests and promoters are pleased, for it protects existing rights, and grants ample protection while constructing new projects and putting the water to beneficial use.

The public is generally satisfied with the law, for it has added value to existing rights through security of title, and freedom from long and expensive litigation. It has stimulated development. It has discour-

aged the barter and sale of water by speculators apart from the use, and has prevented the monopolization of unused waters by legal obstructionists, or through the purchase of worthless lands bordering the streams. It has also given particular satisfaction to those interested in the highest development of the state, for the reason that there is a special tribunal to represent the state in all water right determinations. No longer will the solemn spectacle be endured of a court being compelled to divide up public streams among several litigants who happen to be parties to a suit without regard to the rights of others on the same stream, or the rights of prospective appropriators. Nor will the new appropriator be permitted to claim an unreasonable amount of such surplus water. There is now a public official with power to limit his appropriation to an amount which he can reasonably put to beneficial use, or deny the application in whole or in part, if it conflicts with existing rights, or is a menace to the safety or the welfare of the public. A state water department to dispose of state waters is more necessary for states in the arid West, than state land departments.

Machinery of Courts Inadequate

Having neglected our water right records in the past, it becomes necessary to create special machinery, and a new procedure for determining and recording old water rights. When started, this record should be completed as rapidly as possible.

The rules of pleading and of evidence in court practice in general produce biased testimony, leaving the court to guess at the truth. This practice leads to great expense, delay, and confusion. Take for example the Snake River adjudications in Idaho. These, I am informed, have been in the courts for years. Occasionally the case is opened up, for a few weeks, and new testimony offered. By this time maps upon which the adjudication was based are necessarily obsolete, and it would doubtless prove more economical to abandon the proceeding and start all over again under a new procedure, with a single expert head, so you can hold him responsible for results. It is merely a guess to say that no finite mind can analyze and digest the mass of testimony which has accumulated in these cases so as to do justice to all under present conditions. It is believed that a single executive officer as provided in the recent Washington law, is preferable to the commission plan as had in Oregon.

Simple, inexpensive maps are made in Oregon showing the location of ditches, irrigated areas, power houses, etc. These maps are submitted at the hearings and are almost invariably accepted as correct by the water users. Their claims are presented on simple blank forms which are carefully scrutinized by the superintendent to determine their accuracy before acceptance. These claims are later submitted to the inspection of all water users and contents permitted. In this way an adjudication is primarily a clerical job tabulating the claims as presented. It is unnecessary to produce preponderance of biased testimony to prove the facts which can be ascertained by a disinterested survey. The few contests which are tried out in the usual way, as a rule affect only a small percentage of the claimants.

These proceedings are nine-tenths clerical, admin-

istrative and engineering, and about one-tenth judicial. The courts in Oregon welcomed the creation of the new tribunal to take over this work. They have upheld the law in every case so far presented.

Court Approved

The constitutionality of these administrative water right determinations came before the Supreme Court of the United States for the first time in March, 1916, in the Oregon case of Pacific Live Stock Co. vs. Lewis (241 U. S. 440).

The highest tribunal in the land has placed the stamp of its approval on our procedure for the determination of water rights, and said in unmistakable terms that this procedure deprives no man of his property without just compensation, denies to no man the equal protection of the law, and violates in no way the fourteenth amendment to the Federal Constitution guaranteeing such protection.

The court has said in referring to the water code: "It adopts a comprehensive scheme for securing an economical, orderly and equitable distribution of the waters to those entitled to their use."

Four important points were decided: First, the district court was upheld in declining to take jurisdiction over the proceedings upon application of one of California's powerful cattle corporations. One of the grounds for refusing to assume jurisdiction was that the controversy was not separable, and it may safely be assumed that at no stage of the proceeding, whether before the board or the court, can it be transferred to the federal court.

Second, the Supreme Court followed the state court's interpretation of the statute relative to the character of the proceedings before the board, declaring them to be administrative and not judicial.

Third, the maps and data collected by the state engineer, it was held, could properly be considered as evidence by the board and the courts, though the same was not sworn to. Such data have the weight of prima facie evidence and are not conclusive.

Fourth, in view of the fact that it was necessary that some plan be provided for the distribution of the water during the pendency of the proceedings before the court, it was deemed proper that the board's order of determination be enforceable unless suspended by a stay bond as provided in the act. It was also held that the fees collected were reasonable and the manner of assessment equitable. A perusal of the opinion must leave the impression that the court looked with favor upon the whole proceeding.

The Oregon water code is undoubtedly the most completely adjudicated water code in the United States. Practically every important phase of the law has been passed upon either by the Supreme Court of the State of Oregon or the Supreme Court of the United States. Owing to the many interstate streams, there has been a tendency for many years to secure as far as possible, uniform water laws in the Western States. The Supreme Court decision in this case forms the basis for such uniform laws, and it is to be hoped that any statutes along this line which are enacted in the future will follow these well established principles, thus facilitating the adjustment of interstate disputes through uniformity of state laws.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Where does all the heat go in one pound of fuel oil used in steam generation? This is a vital question in fuel economy, as upon the definite location of the heat wastes depends the ability of the engineer to increase the power plant economy. In the following discussion the burning of one pound of fuel oil, holding in suspension 19,450 Btu. of heat energy, is traced in its journey through the furnace, and the necessary formulas for computing the heat balance are established.—The Editor.)

THE HEAT BALANCE IN FUEL OIL PRACTICE

Let us now examine the various channels of heat transfer going on in the boiler and see how the details of the heat balance are set forth. In this discussion H_o will represent the calorific value of one pound of fuel oil under test.

(a) a. **The total heat absorbed by the boiler.** As has been previously shown, the equivalent evaporation of a boiler per pound of oil represents the number of pounds of water which would be evaporated into steam per pound of oil if the water was at 212° F. and under atmospheric pressure, and this water then converted into dry saturated steam at the same temperature and pressure. It is self-evident then that the total heat absorbed by the boiler for each pound of oil burned in the furnace is equal to the equivalent evaporation multiplied by the heat necessary to convert one pound of water into steam under conditions just mentioned. This quantity of heat has been found by Marks and Davis to be 970.4 B. t. u., as set forth in previous discussions. Representing this in a formula the total heat H_t absorbed by the boiler per pound of fuel is

$$H_t = M_e \times L_e \dots\dots\dots (1)$$

in which H_t is the total heat absorbed by the boiler per pound of dry fuel, M_e the equivalent evaporation per pound of oil, and L_e the latent heat of evaporation at 212° F., which is 970.4 B. t. u. Hence, if the equivalent evaporation of a boiler is found by test to be 28.225 pounds of water per hour, and if the measurement of oil shows that 1872 pounds of oil have been consumed

$$M_e = \frac{28225}{1872}$$

$$\therefore H_t = \frac{28225}{1872} \times 970.4 = 14639$$

b. **Heat absorbed by boiler for atomization.** In ordinary practice of fuel oil consumption, there are three methods of atomization employed. In the larger power plants the use of steam for atomization purposes, or in other words, the diverting of steam from the boiler into the furnace in order to atomize the oils, seems to have by far the preference. It is proposed to alter the rules of the American Society of Mechanical Engineers so that the heat represented by the steam used in atomization must be subtracted from the total heat absorbed by the boiler in order to compute the net evaporative power of the boiler. Hence to make this computation we must know the number of pounds of steam used in atomization per pound of oil

burned. Methods of arriving at this result have been described in a previous chapter.

Calling M_s the pounds of steam used in atomization per pound of fuel burned, H_s the total heat per pound of steam so used, and h_1 the heat in the entering feed water, and H_a the heat absorbed by the boiler per pound of fuel in atomizing the oil, it is evident that

$$H_a = M_s (H_s - h_1) \dots\dots\dots (2)$$

Thus it has been found in the test under description that .530 pounds of steam were utilized in atomization per pound of oil. Saturated steam at a temperature of 381.9° was used. From the steam tables such steam is found to have a total heat of 1198.08 B. t. u. The entering feed water was at a temperature of 169.1° F. and has a heat of liquid amounting to 136.87 B. t. u. We find by substitution that the heat absorbed in atomizing the oil is computed as follows:

$$H_a = .530 (1198.98 - 136.87) = 562.44 \text{ B. t. u.}$$

c. **Net heat absorbed by boiler for power generation.** Since then the heat utilized in atomization must be subtracted from the total heat absorbed by the boiler, to ascertain the net heat H_n absorbed by the boiler for power generation, we have the following formula:

$$H_n = H_t - H_a \dots\dots\dots (3)$$

$$\therefore H_n = 14639 - 562.44 = 14076.56 \text{ B. t. u.}$$

(b) **Loss due to water in the fuel.**

All fuels contain a certain amount of moisture. It is evident that since it requires considerable heat to convert this moisture into steam and then to send it forth from the chimney in a superheated condition, a definite loss is thereby sustained in boiler operation. This moisture must first be raised to 212° F., then converted into steam, and then heated to the temperature of the outgoing chimney gases. If we let M_w be the proportion by weight of moisture in the one pound of fuel, t_o the temperature of the oil entering the burner, t_g the temperature of the escaping gases, and H_m the loss due to moisture in the fuel per pound of fuel burned, we may write at once an equation representing this loss.

Thus

$$H_m = M_w [212 - t_o + 970.4 + .47 (t_g - 212)] \dots (4)$$

The reasons for this formula are seen by inspection. To raise each pound of moisture from t_o to 212° F. would require as many B. t. u. as the raise in temperature, in other words $(212 - t_o)$ B. t. u. Again, to evaporate each pound would require 970.4 B. t. u., and as .47 of a B.t.u. are required to superheat one pound of steam one degree in temperature at atmospheric pressure, each pound of steam superheated to the temperature of the outgoing chimney gases would require .47

($t_g - 212$) B. t. u. Therefore, the total heat required for M_w pounds would be as indicated in the formula above by summing up these separate components.

Thus in the test under consideration, let us assume that the fuel contains 1 per cent of moisture; that its entering temperature is 96° F., and that the temperature of the escaping gases is 400° F. Hence

$$H_m = .01 [212 - 96 + 970.4 + .47 (400 - 212)] = 11.67 \text{ B. t. u.}$$

(c) **Loss due to water formed by burning hydrogen.**

In the chapter on chimney gas analysis, it was seen that the Orsat Apparatus is so constructed that the vapor or superheated steam formed by the burning of the hydrogen content in the fuel is condensed into water upon entering the burette; hence the Orsat analysis indicates only dry flue gases and takes no account of the percentage of steam actually present in these gases. It is seen then that the moisture formed by the burning of hydrogen must also create a loss as it journeys upward through the boiler. Assuming H_h to be the heat lost due to the moisture formed by the burning of hydrogen by following identically similar processes of reasoning just employed in the considerations of the loss due to the moisture in the fuel, we find that each pound of moisture formed by the burning of hydrogen requires

$$[212 - t_o + 970.4 + .47 (t_g - 212)] \text{ B. t. u.}$$

From the principles of chemistry each pound of hydrogen combines with 8 pounds of oxygen, thereby forming 9 pounds of water or steam. This relationship gives us a ready means of computing the weight of water vapor formed by the burning of hydrogen, although the Orsat analysis failed to do so. Assuming M_h to be the proportion by weight of hydrogen per pound of fuel oil burned, we have

$$H_h = 9M_h [212 - t_o + 970.4 + .47 (t_g - 212)] \dots (5)$$

By referring to the test data, we find that the fuel analysis shows .11 pounds of hydrogen per pound of fuel, that the temperature of entering air is 84° and the temperature of the escaping gases 400° , therefore

$$H_h = 9 \times .11 [212 - 84 + 970.4 + .47 (400 - 212)] = 1166.97 \text{ B. t. u.}$$

(d) **Loss due to heat carried away by dry gases.**

From the Orsat analysis, by means of well-known standard formulas, the pounds of dry gas passing up the chimney per pound of fuel burned may be easily computed by means of several different formulas. It is found by experiment that it requires .24 B. t. u. to raise one pound of chimney gas one degree in temperature. Hence if M_g be the pounds of dry chimney gas per pound of fuel, the total heat wasted H_g in raising the temperature of these dry gases is seen to be

$$H_g = .24 (t_g - t_a) M_g \dots \dots \dots (6)$$

In this particular instance, let us assume that by the application of our formula we find that 19.83 pounds of dry chimney gas are formed per pound of fuel burned; that the temperature of the entering air is 84.1° , and that of the outgoing chimney gases 400° . Hence

$$H_g = .24 (400 - 84) 19.83 = 1503.91 \text{ B. t. u.}$$

(e) **Loss due to carbon monoxide.**

In the burning of every pound of carbon to carbon dioxide, 14,600 B. t. u. are liberated. When the carbon is not completely burned but passes up the chimney in the form of carbon monoxide only 4450 B. t. u. per pound of carbon so burned are liberated. Hence whenever carbon monoxide appears in the gas analysis it is evident that a definite loss is being sustained due to this incomplete combustion of the carbon.

For every pound of carbon which passes up the chimney as carbon monoxide, a net loss of 10,150 B. t. u. are thus uselessly thrown away. Let us assume that one pound of carbon volumetrically produces V_1 units by volume of carbon dioxide and V_3 units by volume of carbon monoxide. If this is true it is evi-

dent that in every pound of carbon so burned $\frac{V_3}{V_1 + V_3}$

pounds are converted into carbon monoxide, which represents a loss of 10,150 B. t. u. per pound. Hence if there are C units of carbon by weight in each pound of the fuel, the formula to be applied to ascertain the loss due to incomplete combustion H_c is

$$H_c = C \frac{V_3}{V_1 + V_3} \times 10,150 \dots \dots \dots (7)$$

In the particular case cited above the fuel has .86 proportions by weight of carbon and .01 proportions by volume go out of the chimney in the form of carbon monoxide and .0979 proportions by volume in the form of carbon dioxide. Then the total loss is evidently

$$H_c = .86 \frac{10150 \times .01}{.0979 + .01} = 801.82 \text{ B. t. u.}$$

(f) a. **Loss due to evaporating steam for atomization.**

By referring back to (a) b in this discussion, we find that the loss due to evaporating steam used in atomization is represented by the formula

$$H_a = M_s (H_s - h_1) \dots \dots \dots (8)$$

and in the particular instance in question it is 56.44 B. t. u. per pound of fuel burned. Where the steam used in atomization is brought from an outside source, it would, of course, be necessary to neglect the correction made under (a) b, although the quantity under this heading must still be taken into account.

b. **Loss due to superheating steam used for atomization.**

If the steam has been injected into the furnace in atomization, it is clearly evident that for every pound so injected, .47 of a B. t. u. are required in superheating it to the temperature of the outgoing chimney gases. Hence the loss so sustained is seen at once to be computed from the formula:

$$H_{sa} = .47 M_s (t_g - t_s) \dots \dots \dots (9)$$

in which H_{sa} is the loss due to superheating steam due to atomization per pound of fuel burned; M_s is the proportion by weight of steam used in atomization per pound of oil; t_g the temperature of escaping flue gas; and t_s the temperature of steam used in atomization.

Since we have found that .53 pound of steam were used per pound of oil in atomization and the temperature of the outgoing chimney gases was 400°, and that of the inlet temperature of the steam 381.9°, we see at once that

$$H_{sa} = .47 \times .53 (400 - 381.9) = 4.51 \text{ B. t. u. per pound of oil burned.}$$

c. **Total loss in atomization.** If now the steam supply in atomization is taken from the boiler under test, or even brought from a separate supply, it is clear that the total loss so sustained is the sum of H_a and H_{sa} . Hence the total loss H_{ta} in atomization is

$$H_{ta} = H_a + H_{sa} \dots\dots\dots (10)$$

In the case at issue then,

$$H_{ta} = 562.44 + 4.51 = 566.95 \text{ B. t. u.}$$

(g) **Loss due to moisture in entering air.**

All air drawn into a furnace holds in suspension a certain amount of moisture. In previous instances of moisture entering the flue gas it is seen that a loss is sustained in superheating this moisture content to the temperature of the outgoing chimney gases. Let M_a be the pounds of air that enter the furnace per pound of fuel burned, and let K be the proportion by weight of moisture in this entering air, then the loss in heat units H_{ma} due to this moisture may be expressed at once by the formula

$$H_{ma} = .47 M_a K (t_g - t_a) \dots\dots\dots (11)$$

In the illustration cited in this case it was found that there were 22.82 pounds of chimney gas formed, which means that 21.82 pounds of air were drawn into the furnace to burn one pound of fuel oil; that the entering moisture represented .75 per cent of the entering air which found its way into the furnace at a temperature of 84° and escaped from the chimney at a temperature of 400°.

Therefore

$$H_{ma} = .47 (21.82) \times .0075 (400 - 84) = 23.18 \text{ B.t.u.}$$

(h) **Stray losses.**

In order to make a perfect balance between all of the various factors entering a heat balance, the residual heat of each pound of oil not otherwise accounted for is thrown into a column headed "Stray Losses." It is clearly evident that this loss is equal to the calorific value of the fuel per pound less the sum of all the heat accounted for in the various columns cited above. Hence if H_s represents the stray losses per pound of fuel, and H_o the calorific value of one pound of fuel oil under test, we may write the formula as follows:

$$H_s = H_o - (H_n + H_m + H_b + H_g + H_e + H_{ta} + H_{ma}) \dots (12)$$

and in the case at issue by summarizing the columns we find this to be 18151.06 B. t. u.

$$\therefore H_s = 19450 - 18151.06 = 1298.94 \text{ B. t. u.}$$

(i) **Total Calorific Value or Summary.**

We are now in a position to summarize the complete heat balance. The various items just discussed

will be seen to be represented both in B. t. u. per pound and in percentages, as follows:

Summary for Heat Balance

	Losses		Heat Available
	in B. t. u.	%	19450
Total B. t. u. in 1 pound water free oil..			
(a) a. In total heat absorbed by boiler	14639.00		
b. Heat absorbed for atomization	562.44		
c. Net heat absorbed for power.....	14076.56	72.37	
(b) Loss due to moisture in fuel.....	11.67	.06	
(c) Loss due to moisture of burning H.....	1166.97	6.00	
(d) Loss due to heat carried away by gases	1503.91	7.73	
(e) Loss due to incomplete combustion of C.	801.82	4.12	
(f) a. Loss due to evaporation of steam for atomization.....	562.44		
b. Loss due to superheating of steam by atomization.....	4.51		
c. Total loss due to atomization.....	566.95	2.92	
(g) Loss due to moisture of entering air....	23.18	.12	
(h) Stray losses	1298.94	6.68	
	19450.00	100.00	19450

The Net Boiler Efficiency.—In fuel oil central station practice, due to the fact that a portion of the steam generated in the boiler is used for atomization, we need further definition for true boiler efficiency than the notation set forth in the Rules for Boiler Tests advised by the Power Test Committee of the American Society of Mechanical Engineers. The net boiler efficiency B_{ne} for the boiler will be considered as that resulting from taking the ratio of the heat H_n represented in the useful steam evaporated by the boiler per pound of oil fired to the total heat H_o given out by each pound of oil burned. Thus

$$B_{ne} = \frac{H_n}{H_o} \dots\dots\dots (13)$$

In the data set forth in the heat balance just computed we find then that

$$B_{ne} = \frac{14076.56}{19450} = 72.37\%$$

The data from which the heat balance and boiler efficiency illustration was computed in this chapter is summarized as follows:

Summary of Data Used

Calorific value of dry fuel oil per pound.....	19,450 B. t. u.
Equivalent evaporation of water per hour.....	28,225 lb.
Consumption of dry fuel oil per hour.....	1 872 lb.
Steam used in atomization per lb. of dry fuel oil ....	.520 lb.
Temp. of saturated steam used in atomization.....	381.9° F.
Temp. of feed water	169.1° F.
Per cent of moisture in fuel oil.....	1.0%
Temp. of entering fuel oil.....	96° F.
Temp. of flue gases.....	400° F.
Hydrogen content of fuel	11.0%
Carbon content of fuel.....	86.6%
Temp. of entering air.....	84° F.
Weight of dry chimney gases per lb. of dry fuel	19.83 lb.
Weight of entering air per lb. of dry fuel oil.....	21.82 lb.
Carbon dioxide in flue gas.....	9.79%
Carbon monoxide in flue gas.....	1.00%
Moisture of entering air from boiler room.....	.75%

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

AN ELECTRICAL RED CROSS DANCE

BY F. D. WEBER

(An electrical dance which was made possible by the electrical unions, contractor-dealers and power companies of Portland, and from which 100 per cent of the receipts were turned over to the Red Cross, is a record worth duplicating. The beautiful electrical effects of the decorations, as well as a record of the service so generously presented by the electrical workers, are given in the interesting article which follows. The author is chief inspector of the electrical division of the Oregon Equitable Underwriters' Bureau.—The Editor.)

On the nights of April 4, 5 and 6, the Public Auditorium, Portland, Oregon, blazed forth in a magnificent display of patriotic colors for a series of three dances for the benefit of the Red Cross.

This wonderful electrical display was made possible and accomplished by the three local unions of the International Brotherhood of Electrical Workers. The unions donating their time were: Union No. 125, Linemen's Union; Union No. 44A, Telephone Girls' Union; and Union No. 48, Inside Workers' Union.

Through the willing co-operation of the Electrical Contractors' Association, the county of Multnomah, the city of Portland, and various business interests of Portland, the necessary materials were procured.

The Portland Railway, Light & Power Company furnished the power free of charge, and also the Northwestern Electric Company, the Pacific Telephone & Telegraph Company, and Home Telephone & Telegraph Company, actively assisted.

Mr. J. C. Caine was general chairman of the committee on arrangements, while W. H. Pickering, electrician for Multnomah county, and V. H. Haybarker, electrician for The Oregonian, were directly in charge of the electrical decorations. The decorations consisted of the following:

The general color scheme was red, white and blue, the interior finish of the Auditorium being white. On Third street, the main approach to the Auditorium, there were erected red, white and blue streamers, supported on the trolley span wires.

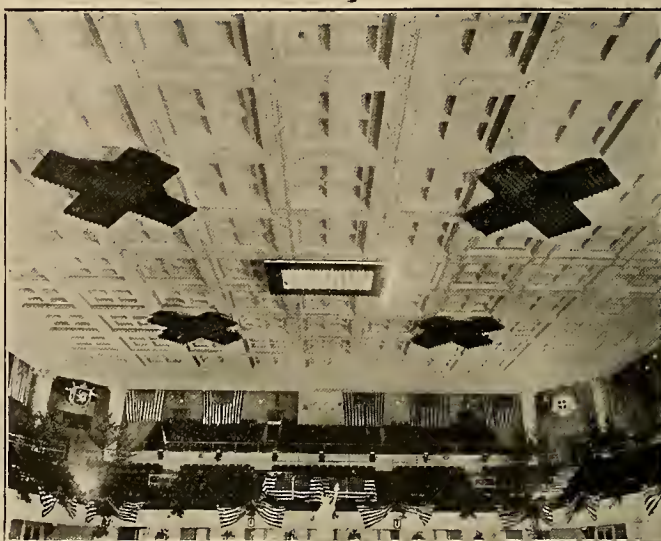
Four red crosses of 500 16-candlepower lamps each, with the lamps two in series, and a service flag of 600 16-candlepower lamps, with the lamps two in series, also, were installed on the ceiling of the main auditorium to replace the large cluster lighting fixtures. At various locations around the Auditorium there were placed illuminated coats-of-arms of the principal allied nations; these were also in colored lights. Set about the balcony, there were 35 300-watt special lensed floodlights which were directed on the ornamental ceiling. The color scheme here, too, was red and blue, which produced a brilliant border completely around the ceiling.

Located between the flags on the balcony there were 48 "R. I." pendants.

Spaced uniformly on the two sides and back of the

Auditorium, illuminated block letters in colors were hung, which read, "It's Your Flag." These letters also served as a meeting place for various groups during the evening.

At various points on the dance floor there were twelve colonial pillars erected with glass globes on the top containing a 4-candlepower lamp, with red and blue lamps in alternate pillars, the glass globe being surrounded by three 4-candlepower lamps in colors.



RED CROSSES AND SERVICE FLAGS

The cost of decorations and illumination would have amounted to thousands of dollars—but time and material was donated and 100 per cent of the receipts given to the Red Cross.

In the center of the stage, another red cross was hung, consisting of 200 16-candlepower lamps, two in series.

The stage border lights were also used for color effects.

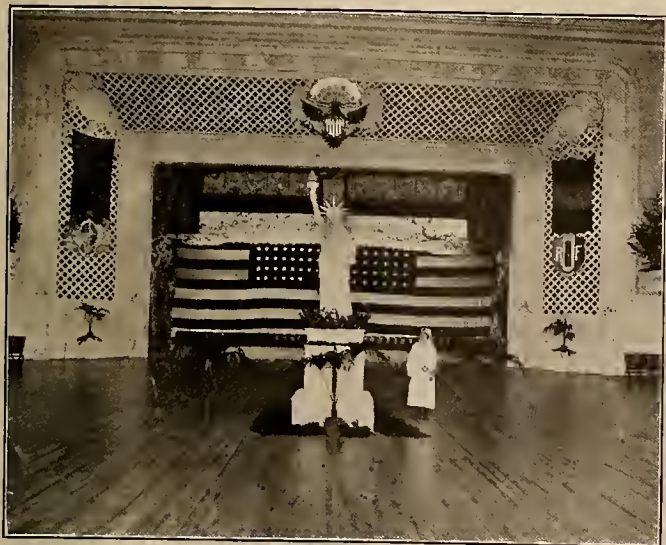
In the center of the dance floor, a large statue of Liberty was erected. Her torch was amber colored and around her feet were red and blue lights.

Throughout the foyer and wings of the Auditorium all the white lamps in the fixtures were changed to red and blue.

Besides the electrical effects, about 150 flags were used and a large drayload of fir evergreens. During the dances the girls of the Telephone Union appeared in the uniform of the Red Cross nurse, making a very impressive appearance.

In order to have a dance floor of 10,000 square feet available, it was necessary to take out the opera seats and put in the portable dance floor. Therefore, with all the labor necessary for the electrical decorations and other details—if the materials had had to be purchased—the cost of this entertainment would have been in the neighborhood of \$10,000. All this labor,

however, was donated by the electrical unions, and principally performed at night.



THE OTHER END OF THE HALL

The decorations were very beautiful and showed what might be done with electric lights, for the benefit of those who may have community gatherings to decorate for in the future.

This therefore serves as a tribute to the patriotic spirit of these unions and the other organizations who aided them in their magnificent service.

The box office receipts of \$3500—one hundred per cent—were donated to the Red Cross.

RECENT ORDINANCES FOR CONTRACTING WORK IN SAN FRANCISCO

(The following ordinances represent rulings recently made by the Department of Electricity of San Francisco. In the light of practice as permitted elsewhere, these regulations have particular interest.—The Editor.)

In order to properly support fixtures as required by Rule 30, National Electrical Code, the following methods shall be observed in order to obtain this department's approval certificate:

1. Fixtures, both wall and ceiling on new work, shall be supported from the outlet box by means of studs or by metal straps fastened to studs or lugs in the boxes. Special fixtures of a type which cannot be supported except by wood screws may be so installed by special permission.

2. Machine screws shall be used to fasten fixtures to straps to permit inspection of finished work.

3. On old work (that is, fished-in jobs), brackets may be supported by four wood screws of proper length screwed to laths or by metal straps screwed to laths with fixtures at-

tached to straps by machine screws, or by wooden base block (not less than $\frac{3}{4}$ inch thick) securely screwed to lathing.

4. In all work, flanges, chain pendants, bowls, showers, and similar types of fixtures shall be supported from outlet box by studs or by metal straps fastened to studs or lugs in outlet box.

5. Pans of large diameter may have wood screws fastened to laths in outer edge for the purpose of keeping edge of pan close to ceiling, but not for the support of its weight.

6. All wires for bracket outlets in fished-in jobs shall be brought out between laths, cutting out as little lath as possible and not by boring holes through the lath. Plates shall be securely fastened to the uncut or unbroken laths by wood screws of proper length or by toggle bolts.

Ordinance No. 2582, Section "D," provides that "No current shall be turned into such installation until certificate be issued."

In order to rigidly enforce this section of the ordinance, this department will hereafter require that the preliminary permit issued for the work shall be conspicuously posted at the meter-board and there maintained through the entire period in which construction work is being done. Upon the completion and approval of the installation, a white tag will be affixed by the inspector to this permit, authorizing power companies to install meters.

Beginning April 15, 1918, no meters will be set by power companies in San Francisco unless and until such white tag has been placed.

On installations where portions of a building are completed in advance of other portions, permits and white tags to connect the completed portions will be issued by the department and attached by the inspectors so that service may be given the completed portions.

On urgent installations, permission to set meters in advance of the official approval of the installation may be obtained from the chief inspector upon request.

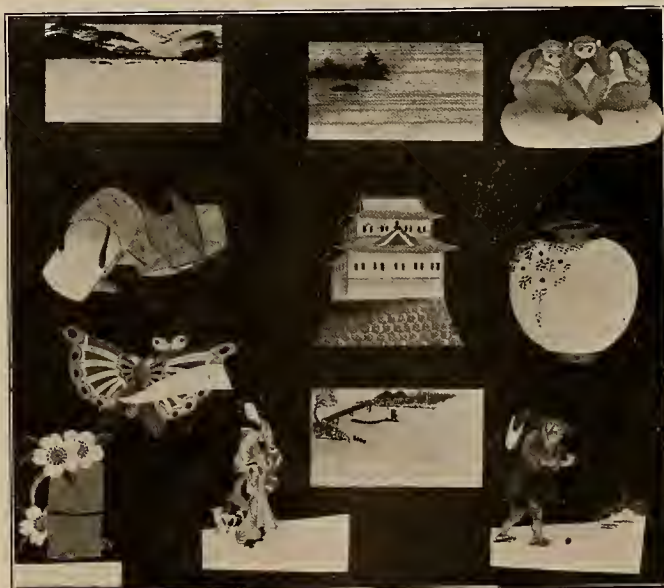
On temporary installations using power for construction purposes, permission to connect shall be afforded during the construction period only and connections made for construction purposes shall not be used for supplying the building.

The use of current for connecting up and testing motors and other equipment is not prohibited, provided the installation is not left in a condition for use.

On all "old" installations, where power companies are required to enlarge the service or meters, notice of such enlargement shall be immediately given the Department of Electricity.

INGENUITY WINS

Here is why the Japanese today lead the world in the little things—details of life that awaken admiration in the observer. These miniature tags and placards have carried Japanese ideas and Japanese ware into every country of the civilized world. This care of details and beauty in the small things of business is a standard which the public recognizes and acknowledges with patronage. The lesson is one which might well be studied by the dealer in electrical ware here in America. There are, for instance, window displays and shelf arrangements and business cards and packages which often might be made attractive by just this careful attention to the beauty of the little things.



IF I WERE AN ELECTRICAL DEALER

BY L. H. NEWBERT

(The series of "If I Were a ——" papers which is being read at the meetings of the San Francisco Development League is proving a source of entertaining as well as helpful suggestion. The author of the analysis given here is manager of the commercial department with the Pacific Gas & Electric Company.—The Editor.)

If I were an electrical dealer I would adopt as my business creed the Golden Rule; in other words, I would serve my customers as I would wish to be served were I a customer.

I would do by the central station as I would have it do by me.

I would deal with the electrical jobber and manufacturer as I would have either deal with me.

I would co-operate with my competitors.

I would locate my store in or adjacent to the shopping district, for the reason that women purchase the great majority of current-consuming devices.

I would endeavor to keep my place of business as attractive as a well conducted jewelry store, and would give particular attention to window display.

I would provide comfortable seating accommodation for waiting customers, having women particularly in mind.

I would make sure that my salespeople had a thorough knowledge of all devices carried in stock, and see that they waited on customers in such manner as to insure their return to my store when again in need of something electrical.

I would take a kindly interest in the welfare of my sales force, and would establish some bonus or profit-sharing plan that would enable them to earn something in addition to their salaries.

I would maintain membership in the California Contractors and Dealers' Association, and would take a practical interest in its activities.

I would support the California Electrical Co-operative Campaign.

I would join the Pacific Coast Section of the National Electric Light Association, and would do my best to attend its meetings.

I would also become a member of the Society for Electrical Development, and would carefully study the literature issued by it. It contains splendid thoughts for persons interested in increasing sales of electrical energy.

I would subscribe for several publications devoted to merchandising, and would encourage my sales people to read them regularly.

I would make liberal use of advertising material obtainable from manufacturers of devices, and would have such literature headed "Purchase your electrical appliances from an electrical dealer." This advice would also appear on my stationery, bills, wrapping papers, etc.

I would keep a card stock record in order that I might readily present, at the close of each month, a statement of my financial condition.

I would accurately determine my overhead expense.

I would endeavor to discount my bills.

I would seek the acquaintance of business men in other lines and discuss with them their business methods with a view to improving my work.

Insofar as my time would permit I would engage in improvement club or other organization work having for its objective the development of the community in which I was located, thereby improving my business opportunities.

Last, but by no means least, I would leave nothing undone to secure the good will of the central station employees, from the local manager down to the office boy.

Success in business comes to those who have the ability to do, and unless a dealer in electrical merchandise can reasonably do the things herein enumerated, he will find it necessary, sooner or later, to seek another field of endeavor.

CURBING SIGNS

BY A. L. SPRING

(Lamp sales are looked upon by many merchants as a part of routine business which requires no special advertising or thought. What can be done by a little attention devoted to this end of the stock is suggested by the following. The idea presented here by the Southern California representative of the California Co-operative Campaign is capable of adaptation for business getting along any line of your electrical supplies or appliances.—The Editor.)

We are accustomed to seeing curbing signs advertising different brands of gasoline and used by Uncle

Sam in his drive for enlistments and Liberty Loan subscriptions, but seldom have we seen one used by an electrical dealer. If this form of advertising is good enough for Our Country, it should be good enough for our business. If it is valuable to other merchants it should be valuable to the electrical dealer.

The accompanying photograph shows the curbing sign in use by W. J. Burke, electrical dealer, 2591 West Pico street, Los Angeles. This merchant's location is on one of the



Recruiting customers

principal thoroughfares between Los Angeles and the beaches, and numerous automobiles and street cars continually pass his store. The total cost of this sign was only \$5.00, and yet it is very effective; the letters are all in white and the background in blue, the same colors used on the cartons and in advertising the brand of lamps that he handles.

This sign has more than doubled Mr. Burke's lamp sales, as well as appreciably increased the balance of his business. The following gives an idea of the drawing power of this form of advertising. The picture was taken on Saturday, and on that day alone two lamp sales aggregating \$26.10 were made which were directly traceable to the sign; in other words, it paid for itself that day. More curbing signs would mean more business for the electrical dealer.

Technical Hints

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

50 DEGREE MOTOR RATINGS

(This article dealing with the new method of rating motors is one of particular timely interest, since motors rated on this basis are now beginning to make their appearance on the market. The need for caution in watching the temperature rise, particularly where motors are exposed to the sun in hot climates, is here emphasized and practical suggestions presented. The material is of especial value to the dealer, contractor, or others who are interested in the everyday application of motors for industrial purposes.—The Editor.)

Electric motors are rated at the normal output, expressed in horsepower, which they will develop under certain specified conditions. The load which a motor can carry is limited either by the permissible temperature rise caused by the current or by sparking at the commutator. The rating of a motor depends largely on the continuity of operation and degree of enclosure of the windings. It is apparent that a motor can be rated higher for intermittent service than for continuous service; conversely, a motor designed for intermittent service must not be used at the same output or load for continuous service. All motors, whether rated for continuous or intermittent duty, can carry loads in excess of their rating. The amount of this overload will depend entirely upon the design and service conditions under which the motor is used. As will be noted later, certain types of motors now coming into the market are not given an overload rating. This is quite in contrast with the earlier methods of rating which provided for a certain amount of overload.

Since the rating of a motor is limited by the heating, it is obvious that the various parts and windings should be as well ventilated as possible; also that their rating is dependent upon the temperature of the surrounding atmosphere. In some cases it is necessary to enclose the windings to protect them from mechanical injury, excessive moisture, dust, or for similar reasons. Motors for industrial purposes are for this reason classified according to the degree of enclosure or protection provided. There are 12 recognized types of which the most common in use are open, semi-enclosed and enclosed.

In accordance with the standard accepted definitions, the "open" machine is of either the pedestal-bearing or end-bracket type where there is no restriction to ventilation, other than that necessitated by good mechanical construction. A "semi-enclosed" machine is one in which the ventilating openings in the frame are protected by wire screen, expanded metal or other suitable perforated covers, having apertures not exceeding $\frac{1}{4}$ of a square inch in area. An "enclosed" machine is one so completely enclosed by integral or auxiliary covers as to prevent a circulation of air between the inside and outside of its case, but not sufficiently tight to be termed airtight.

It is apparent that the more completely the windings are enclosed, the poorer the ventilation and therefore the lower the rating for a given frame size and temperature rise. Semi-enclosed motors can usually be

operated at the output of the corresponding motor when not enclosed but at a higher temperature rise. An enclosed motor must be built in a much larger frame than the corresponding open motor. However, it is customary to operate enclosed motors at a higher temperature than is allowed for open motors. The open motor has the best possible ventilation, and therefore for a given rating is the cheapest motor to use, and should always be selected when conditions will permit.

In any case, whether the motor is open or enclosed, it should not be operated under conditions that will allow the temperature to reach a point that will cause the insulation employed in its construction to deteriorate. However, the most careful investigation, supported by the results of wide experience, has shown that there is no advantage in operating electrical machinery at temperatures materially lower than the safe limits permissible for the insulating materials employed in its construction. The American Institute of Electrical Engineers (A. I. E. E.) in its issue of Standardization Rules, has made definite recommendations regarding the permissible temperature and temperature rises to which various insulating materials may safely be subjected. The resultant temperature rise recommended for the ordinary general purpose open type motor is 50 deg. C. See A. I. E. E. Standardization Rules, Section 302, 341, to 348 inclusive, and Table III, page 38, Class A of the edition of October, 1916.

As will be noted in the foregoing paragraph, all temperature measurements in the A. I. E. E. rules are expressed in degrees Centigrade. Accordingly, temperature measurements throughout this article will be expressed in the same manner. However, the following table of comparison between the Centigrade and Fahrenheit scales for the values to be used in this article is given for those who are more familiar with the Fahrenheit thermometer.

Table of Comparison Between Centigrade and Fahrenheit Scales

Centigrade	Fahrenheit
15	59
25	77
40	104
50	122
90	194
105	221

The Electric Power Club, an association of motor manufacturers, has endorsed the action of the A. I. E. E. by adopting as a standard a continuous time rating for open type motors designated as the "50 degree" rating.

Heretofore, standard general purpose motors have been designed and sold on the basis of a double rating; that is, to operate continuously at full load with a temperature rise not to exceed 40 deg. C. and following this for 2 hours at 25 per cent overload with a temperature rise not exceeding 55 deg. C. These temperatures were based on the thermometer method of measurement with the ambient temperature of reference, that is, the temperature of the air surrounding the machine taken as 25 deg. C.

Continuous rated 50 degree motors are based on a single rating, which for a given frame size and for

continuous operation is the highest, consistent with long life of insulation. These motors will carry full load continuously with a temperature rise not exceeding 50 deg. C. In this case, also, the temperatures are to be taken by the thermometer method but are based on a temperature of reference of 40 deg. C. instead of 35 deg. C., which was the standard temperature of reference for the old method of rating. It should be understood that continuous rated 50 degree motors are not given an overload rating, but will carry a momentary overload of 50 per cent without injurious heating or sparking. Accordingly, these motors should be used for conditions in which the load requirements are accurately known, and under which the motor will not be subjected to load in excess of its rating.

Those of our readers who are interested in the method of arriving at this maximum allowable temperature rise of 50 degrees for continued rated motors, are referred to Table III of the Standardization Rules heretofore mentioned. This table gives the highest temperature to which Class A insulating materials, such as are commonly employed in the construction of industrial motors, should be subjected as being 105 deg. C. under any condition. Class A insulating materials include cotton, silk, paper and similar materials, when so treated or impregnated as to increase the thermal limit, or when permanently immersed in oil; also enameled wire. In accordance with the Standardization Rules the ambient temperature of reference, when the cooling medium is air, shall be 40 deg. C., as previously stated. By deducting this temperature of reference from the maximum permissible temperature for Class A insulating materials, the permissible temperature rise is obtained.

As it is usually impossible to determine the maximum temperature, that is, the temperature of the hottest spot attained in insulated windings, a correction factor must be applied to the observable measured temperature to approximate the difference between the actual maximum temperature and the measured temperature by the method used. This correction or margin of security is provided to cover the errors due to the fallibility in the location of measuring devices, as well as inherent inaccuracies in measuring and methods.

There are three different methods of determining the temperature of the various parts of a machine. One is the thermometer method. This method consists of applying mercury or alcohol thermometers, preferably having a Centigrade scale, to the hottest accessible part of the completed machine. With this method the hottest spot temperature is estimated by adding a correction of 15 deg. C. to the highest observable temperature as shown by the thermometer. As already shown, the maximum temperature to which Class A insulating materials should be subjected is 105 deg. C. Applying a correction factor of 15 deg. C., gives 90 deg. C. as the maximum observable temperature measured by thermometer. In other words, when the observable temperature measured by thermometer is 90 deg. C., the hottest spot temperature in the windings is assumed to be 105 deg. C. Deducting the temperature of reference, 40 deg. C., from this maximum observable temperature, 90 degrees, gives a tempera-

ture rise of 50 degrees. That is, the maximum observable temperature rise taken by the thermometer method must not exceed 50 deg. C.

In comparing the applicability of two motors of the same horsepower rating, the one on the single continuous rated basis of 50 degrees rise and the other on the old 40 degree or double rated basis, it will often be found that if the load requirements are carefully ascertained, the motor without overload capacity will operate successfully because the particular service under consideration may not require the margin of safety available in the double rated motor.

In making motor applications it must be remembered that the maximum observable temperature taken by the thermometer must not exceed 90 deg. C., which corresponds to an assumed hottest spot temperature in the windings of 105 deg. C., under any conditions. So if the room temperature should exceed 40 deg. C., a temperature rise of 50 deg. C. could not be allowed, as otherwise the motor would attain a temperature higher than that to which the insulation could be safely subjected. In cases where the room temperature is likely to be higher than 40 deg. a larger motor will be required. This point will need to be watched carefully where motors are exposed directly to the rays of the sun such as they frequently are in connection with irrigating plants in the West.

Further, care must be used in applying these motors to centrifugal pumps or blowers. In these machines, the load increases approximately in proportion to the cube of the speed. Thus, a 5 per cent increase in speed would overload the motor about 15 per cent. Errors of this kind can easily result from slight variations in pulley diameters. Again, when using centrifugal pumps there is always danger of the driving motor being overloaded in case the head against which the pump is working is reduced.

In the future more care will also be required in selecting fuses or relays for these 50 degree motors, since they are not intended to be operated under overloads except of a momentary nature. For these motors, running fuses or relays rated at 110 per cent of the motor amperes will probably be adopted as standard.

A number of manufacturers already have lines of motors rated on this basis in production and will soon have them available for delivery. In fact, one company has been delivering many sizes of direct current motors for some time and has just recently announced that a number of ratings of polyphase motors are also ready. Some manufacturers are simply re-rating their older motors to comply with the new standards, while others are actually bringing out new lines.

The information given here applies only to standard open type motors such as are commonly used for industrial service. Other lines of electrical machines are now, however, continuously rated, but different methods of determining the temperature may be used and the correction factor given here does not necessarily apply to all types of electrical machinery, kinds of insulation or methods of measurement. Full information on these points is given in the Standardization Rules heretofore mentioned.

DEL MONTE WAR SERVICE CONVENTIONS

("The greatest meeting that has ever been held among the electrical men of the West," is the general verdict on the recent joint convention at Del Monte. In serious attainment, the convention fully justified itself as a war measure in inspiration and practical accomplishment. And the many delightful opportunities for social intercourse helped to provide that foundation for cordial good fellowship which is the basis of later co-operative ideals.—The Editor.)

DEL MONTE WAR SERVICE CONVENTIONS



In the quaint streets of Monterey

WITHOUT question, a new era in electrical affairs has been initiated in the West. The great Del Monte conventions of the California Association of Electrical Contractors and Dealers, the Pacific Division of the Electrical Supply Jobbers Association, and the Pacific Coast Section N. E. L. A., are at a close, and the unanimous verdict from

all sides is that a true war service has been rendered to the industry and the nation and results attained that once again emphasize the splendid spirit of helpfulness that is now so prevalent in the West.

From the time that the carefree jobbers began to make their appearance at the beautiful Hotel Del Monte on Monday morning, on down through the week until the last farewells were said on the following Sunday, an enthusiasm prevailed at the sessions of these conventions that clearly marks the advent of a new era in the electrical industry in the West. This new spirit was further emphasized at the various meetings of the conventions. And the final climax was the strong support that was given to the appeal made by W. L. Goodwin for nationalization of contractor-dealer effort agreeable to the "Goodwin Plan."

Then came the arrival of the Southern California delegation on Thursday morning, where to the weird shrieks of the Aztec yell, Captain Jackson and his cohorts welcomed W. A. Brackenridge, R. H. Ballard, H. H. Jones and the host of others from Southern California, who had in the previous year established such a wonderful record in convention ideals at Riverside.

The splendid war service ideals that were brought out at Thursday's session of the engineering section were fully equaled again in the evening when the women of the convention under the leadership of Mrs. H. F. Jackson, held a well-attended war service session to which all in attendance at the convention — men and women — were invited.

Miss Gertrude Tucker, secretary to the president of the Southern California Edison Company, read a paper on "What women can do to help maintain the pub-

lic utility efficiency." She dealt largely with the splendid new ideals that have recently been instituted in her company and deeply impressed her audience with the effectiveness of this new work among women, now of such increasing importance in the industry. Mrs. F. A. Gibson of the women's war board of the National Council of Defense spoke on "Americanization," and showed how necessary it is for effective work among the foreign element in our present national emergency.

One of the refreshing and delightful entertainment features of the convention was the beautiful exhibit of autochrom pictures by L. P. Lowe on both Wednesday and Thursday evenings. The views were largely taken during the Panama-Pacific International Exposition and showed in colors taken from nature the wonderful scenic effects of the great exposition.

And then after a record breaking day of accomplishment in the commercial section sessions on Friday came the long-to-be-remembered banquet that evening.

Professor Charles Mills Gayley, the newly appointed Dean of the Faculties of the University of California, and of international reputation as a writer, held the vast audience in spellbound attention for 55 minutes while he spoke on "War Service Ideals." In conducting the meeting R. H. Ballard, as toastmaster, who has long been recognized as a leader in utility thought, was never more effective and self-poised than on this occasion. The spot lights and scenic illuminative effects that assisted in the dances of the nations that were presented added their part in inducing the patriotic fervor of the occasion. The audience, too, responded in a marked degree throughout, especially in the singing of the songs from a booklet which had been presented to the convention through the courtesy of one of the manufacturing companies.



THE FAMOUS RIDES IN AND ABOUT DEL MONTE

Here are shown the famous Golf Links, the Seventeen-mile Drive and other points of interest in their relation to San Francisco and the coast cities.



THE CONVENTION ASSEMBLY

The out-of-door sports events held forth on Saturday morning while the afternoon's trip to The Highlands at Carmel-by-the-Sea proved unique and enjoyable to all.

It is hard to place particular credit upon any individual or group of individuals for the splendid work performed by those who had the affair in charge. From the president who opened the convention sessions down through all the committees, a team work, seldom witnessed in affairs of this nature, made it possible to achieve these splendid results now a bright page in the history of the electrical industry in the West.

The convention committee, and the various duties assigned, was composed as follows:

Robert Sibley, chairman. Reception—R. F. Behan. Out-of-door Sports—W. S. Berry. Banquet—T. E. Bibbins. Ladies' Affairs—Arthur Rowe and J. E. Black. Finance—M. A. DeLew. Transportation—W. M. Deming. Entertainment—R. E. Fisher. Registration—H. P. Pitts. Program—J. W. Redpath. Automobile—H. C. Reid. Southern California—A. B. West, E. R. Northmore, H. H. Jones and W. L. Frost.

THE LADIES' EVENTS

In addition to the War Service Session of the women of the conventions on Thursday evening, many little informal social gatherings and auto parties were planned and carried through for the women. On Thursday afternoon the women themselves held a most enjoyable affair in the west sun parlor of the hotel. Those who so ably assisted in this affair were: Mrs. J. A. Vandegrift, Mrs. W. G. Vincent, Mrs. Nelle H. McMaster, Mrs. W. M. Deming, Mrs. R. E. Fisher, Mrs. H. P. Pitts, Mrs. J. E. Woodbridge, Mrs. F. S. Schuyler, Mrs. Robert Sibley, Miss Gertrude Tucker and Miss Clotilde Grunsky.

THE FIELD EVENTS ON SATURDAY

Saturday proved to be a gala day in the bracing air of Del Monte for men and women of the convention who had been devoting such long hours to serious war service discussions in previous days.

W. S. Berry, the able executive in charge of out-of-door sports, and his committee, proved themselves fully equal to the occasion.

CO-OPERATION CHORUS

By A. H. Halloran

(Tune: Funiculi, Funicula)

The dealer has a deuce of a time to sell, sir,
Co-operate! Co-operate!
The other fellow cuts the price to hell, sir,
Co-operate! Co-operate!
The central station sells the lamps and sockets,
Co-operate! Co-operate!
And nothing's left for me but empty pockets.
Co-operate! Co-operate!

Here comes a jolly golfing jobber roaring
Co-operate! Co-operate!
His cost of doing business is soaring.
Co-operate! Co-operate!
His overhead's too high and growing higher.
Co-operate! Co-operate!
He tries to make his profits out of wire.
Co-operate! Co-operate!

PRIZES AND WINNERS OF EVENTS IN OUT-DOOR SPORTS

Golf—

Best net score, Del Monte Cup and \$5.00 War Savings Stamp—E. A. Rogers.

Second best; electric alarm clock and \$5.00 War Savings Stamp—F. E. Blake.

Third best; \$5.00 War Stamp—P. M. Lincoln.

Net score, nearest average; electric lantern—Tie score by M. H. Schnap, R. T. Stafford, Chandler Bloom, W. L. Sawyer, with prize awarded to M. H. Schnap.

Special prize, secret conditions, highest net score; fire extinguisher—Carl Heise.

Jobbers' Old Copper Cup, P & S and Del Monte Cups, to C. C. Hillis.

Jobbers' Manufacturers' Cup—Frank Fagan.

Turner Trophy—Frank Airey.

Ladies' Putting Contest—

Best score; electric percolator and \$5.00 War Stamp—Mrs. Neile H. McMaster.

Second best; \$5.00 War Stamp—Mrs. W. M. Deming.

Third best; electric iron—Mrs. S. J. Lisberger.



MONTE, MAY 6-11, 1918

Chorus.

I am a friendless poor utility, sir.
Co-operate! Co-operate!
I make both gas and electricity, sir.
Co-operate! Co-operate!
I'm ever working for the public good, sir.
Co-operate! Co-operate!
But all my actions are misunderstood, sir.
Co-operate! Co-operate!

Chorus.

And I'm a peddling manufacturer bold.
Co-operate! Co-operate!
I'm back of every little fact you are told.
Co-operate! Co-operate!
I sing my siren song both night and morning.
Co-operate! Co-operate!
Remember now you all have had fair warning.
Co-operate! Co-operate!

Chorus.

Dealers, jobbers, power companies,
Wholesale, retail, manufactories.
Co-operate, co-operate, co-operate, co-operate.
Get together, boys! Co-operate!

Tennis—

Ladies' first prize; electric toaster and \$5.00
War Stamp—Mrs. S. J. Lisberger.
Second; \$5.00 War Stamp—Mrs. W. G. Vincent.
Men's first prize; electric spot light and \$5.00
War Stamp—W. G. Vincent.
Second; \$5.00 War Stamp—John R. Brownell.

Swimming Contest—

Men's first prize; large electric fan and \$5.00
War Stamp—N. A. Bowers.
Second; \$5.00 War Stamp—Frank Boyd.
Ladies' first prize; electric stove and \$5.00 War
Stamp—Miss Eunice McKinley.
Second; \$5.00 War Stamp—Mrs. Kellogg.
Third; electric iron—Mrs. R. S. Masson.

Children's Maze Race—

First prize; \$5.00 War Stamp—John Carlson, Jr.
Second prize; small electric fan — John Francis, Jr.

REWARD!

A \$50 LIBERTY BOND IS OFFERED
FOR THE IDENTIFICATION
OF



The Mysterious Electric Raffles

MYSTERY IS IN OUR MIDST. SOMEWHERE AMONG US
LURKS A MAN WHO IS WANTED—OR IS IT A WOMAN? HE—
OR SHE—MAY STAND BESIDE YOU NOW. WHO IS YOUR
NEIGHBOR?

In order to facilitate the discovery of the mysterious stranger,
the Convention Committee has offered a \$50 Liberty Bond to the
person first addressing Raffles properly, giving his (or her) first
and last name and his* full company name, the introducer to also
give his first and last name and company name. The proper salu-
tation is as follows:

"Pardon me. You are John Jones of the Up-to-Date
Electric Company, the 'Mysterious Electric Raffles.' I
am John Smith of the Know-How Electric Company.
We will win the war and do it electrically."

The first person to thus address Raffles letter perfect will be
announced as the winner at the banquet of Friday evening. Only
registered members attending the convention will be eligible to the
prize.

Announcement of Raffles' first public appearance is made
elsewhere in this issue.

*For convenience sake, we have permitted the masculine pro-
noun to embrace the feminine.

A PAGE FROM THE FIRST JOURNAL SERVICE ISSUE

The mysterious Raffles, whose identification provided so much amusement,
was not discovered until the evening of the banquet, when C. E. Ingalls put
the proper question to Mrs. Lowell Redfield. The page is from one of the two
miniature issues of the Journal of Electricity distributed at convention.

GENERAL SESSION PACIFIC COAST SECTION, N. E. L. A.

(From the first word of the president's report to the close of convention, a spirit of war dedication and co-operation pervaded the gathering. The record of business sessions and the reports of officers of the Pacific Coast Section, N. E. L. A., are here given. Of particular interest are the recommendations of the outgoing president and the election of officers. The progressive policies and executive ability of the new leaders promise a fruitful year for 1918-19.—The Editor.)

BUSINESS SESSIONS

The routine business of the Association was conducted at the opening and closing sessions. President H. F. Jackson made important recommendations for future work, as did likewise the report of the public policy committee, published elsewhere in these columns.

The report of the Public Policy Committee was read by Mr. John A. Britton, who supplemented the written recommendations of the report by an earnest plea that a strong committee be formed to see that the fundamental facts regarding the electric business are printed in the daily press. He recommended that the president be instructed to arrange for an association bureau of publicity and advertising. This recommendation, as well as those contained in the written report, was unanimously adopted.

Mr. Britton also made most favorable reference to the Women's War Service Session, especially commending Miss Gertrude Tucker. Much of the public utility work of the future will be carried on by women and every effort should now be put forth to provide for their proper training.

Resolutions were adopted referring to the necessity for water power development, for greater publicity relative to utility activities, and as favoring a sane program of education and Americanization of our foreign-born population. The help of the several governmental departments interested was requested in studying power problems.

The engineering committee introduced resolutions calling for further study of interconnection, the use of instruments for conserving heat and increasing efficiencies, and for a study of available fuel resources and the adjustment of power business thereto.

A resolution introduced by the commercial committee extended the California Electrical Co-operative Campaign six months beyond December 31, 1918. The recommendations relative to indexing, codifying and cataloging sales data were referred to the new commercial committee.

A roll of honor will be established to contain the names of those enlisted in the defense of the nation, and their membership continued without payment of dues.

The thanks of the Association was extended to the contractors and jobbers association for holding sessions at the same time, and an invitation extended to meet together again. Thanks were also given to the several other associations and commissions represented, including the Northwest Electric Light and Power Association, the Railroad Commission of California, the California Industrial Accident Commission, D. M. Folsom and F. H. Fowler.

Other resolutions were passed thanking the Hotel Del Monte, the officers and the convention committee for their work.

The newly elected officers for the ensuing year are:

President—Samuel Kahn, Western States Gas & Electric Company.

Vice-President—E. R. Davis, Southern California Edison Company.

Vice-President—A. E. Wishon, San Joaquin Light & Power Corporation.

Secretary—A. H. Halloran, Journal of Electricity.

Treasurer—J. F. Pollard, Sierra & San Francisco Power Company.

The executive committee consists of the five officers of the Association, together with the following members:

H. S. Aller, Pacific Gas & Electric Company, Phoenix, Arizona.

Wm. Baurhyte, Los Angeles Gas & Electric Company, Los Angeles.

J. B. Black, Great Western Power Company, San Francisco.

Henry Bostwick, Pacific Gas & Electric Company, San Francisco.

Geo. A. Campbell, Truckee River General Electric Company, Reno, Nevada.

C. M. Einhart, Roswell Gas & Electric Company, Roswell N. M.

D. E. Harris, Pacific States Electric Company, San Francisco.

H. F. Jackson, Sierra & San Francisco Power Company, San Francisco.

H. H. Jones, San Diego Consolidated Gas & Electric Company, San Diego.

Frank Somers, Garden City Electric Company, San Jose.

K. E. Van Kuran, Westinghouse Electric & Mfg. Company, Los Angeles.

A. B. West, Southern Sierras Power Company, Riverside.

RECOMMENDATIONS BY THE PRESIDENT

President H. F. Jackson, in the course of his presidential address, made the following definite recommendations:

1. That the work of the executive committee and officers of the Section during the past year toward a more cordial understanding and a closer physical interconnection between central station companies be carried forward as much as possible, with a view to conserving resources and improving service.

2. That the movement to cement the relationship between central stations, jobbers, manufacturers and contractor-dealers be encouraged, and to this end that the Section officers endeavor to form a committee consisting of one member from each of these interests to devise plans for perfecting a closer co-operation.

3. That an especial effort be made to increase Class B membership.

4. That the Section recommend and urge the National Association at the coming annual meeting to change its Constitution and By-laws so that one-half of payments made by Class A members be returned to the Section for its local needs.

These were referred to a committee consisting of H. H. Jones, C. M. Einhart and T. E. Bibbins.

The committee earnestly commended the annual address of the president of the Geographic Section of the National Electric Light Association for its record of accomplishments and for its clear and forceful expression, and particularly endorsed for favorable action to the committee on resolutions, the adoption of his recommendations.

First—That the endeavor of the executive committee towards a more cordial understanding and closer physical interconnection between central stations and power companies be carried forward.

Second—That the cementing of the relations between central stations, jobbers, manufacturers and contractor-dealers be encouraged by appointment of a committee for that purpose.

Third—That especial effort to increase the interest on the part of Class B membership in the Association.

Fourth — That this Section recommend to the proper authority changes in its Constitution and By-laws regarding the payments made by Class A members.

REPORT OF SECRETARY

Secretary A. H. Haloran reported as follows:
To the Executive Committee and Members, Pacific Coast Section of the National Electric Light Association:
If the enthusiasm and heavy registration at the opening of the convention is any measure of the section's present activity, but few words of past record are needed from the secretary.

The various undertakings of the section are covered in the president's address and the several committee reports. All the papers and reports have been printed in the Journal of Electricity so far in advance of the date of meeting that ample time has been available for study and preparation of discussion. As much of the discussion will be submitted in written form, it has been decided to dispense with the usual stenographic report and publish merely a summary of the essential features brought out by the various speakers.

Under date of April 7th, the Association had enrolled 700 members, classified as follows:

	Arizona	Calif.	Nevada	New Mexico	Total
Class A	10	16	6	9	41
Class B	37	479	13	..	529
Class C .....	..	4	..	1	5
Class D .....	..	54	..	..	54
Class E .....	..	71	..	..	71
	47	624	19	10	700

This shows a numerical membership of about half that of last year, due largely to abnormal conditions brought on by the war. Three Class A memberships have been lost because of absorption by existing member companies. Many Class B and E members are now in the government service. The Class D membership shows nearly 50 per cent increase.

The earnest efforts of the membership committee under the chairmanship of W. L. McKinley have been productive of many renewals and new applications. Especially noteworthy has been the work of H. N. Sessions of the Southern California Edison Company.

The decrease in membership, as will be shown in the Treasurer's report, also means a corresponding decrease in income. As already stated by President Jackson, the National Association allots to a Geographic Section not to exceed half the stated dues paid by its members. Thus it is estimated that at least \$5000 will be paid in stated dues by section members this year, of which amount \$2500 will be returned to the section. In addition, ten Class A members operating in cities of 25,000 or more and paying one-fiftieth of 1 per cent of their gross earnings to the National Association, contribute \$6000 more, none of which is returned to the Geographic Section.

The executive committee has already taken steps to have the National Association rebate half this latter amount toward the conduct of section activities.

The secretary at this time desires to express his appreciation of the co-operation of the members and committees in carrying on the section work during the past year. Special mention should be made of the excellent work of the convention committee, of which Robert Sibley is chairman, and of the hotel and transportation committee, under the direction of W. M. Deming. The activities of the other members speak for themselves in results evident here.

There is every indication that this great meeting will effectively fulfill the true function of a convention—that of instilling in the minds of its members a higher conception of their duty, one to the other, and thus bring about the harmonious and co-ordinated action of every branch of the electrical industry represented in the Pacific Coast Section—"one for all and all for one."

REPORT OF TREASURER

Treasurer A. N. Kemp reported as follows:
For the year ending December 31, 1917, it will be noted that the total receipts amounted to..... \$7,255.50
And disbursements were in the amount of..... 5,248.11

Leaving a balance to be carried forward to the new year of \$2,007.39
Since that date, down to and including May 4, 1918, there has been received a refund on account of engineering advances in the amount of..... 242.70
\$2,250.09

There has been expended, as per the attached memorandum 875.19

Leaving a net balance on hand of..... \$1,374.90
To this there is to be added our proportion of membership dues from the parent association of..... 2,437.50

Making a total cash of \$3,812.40

The budget for the current year agreed upon at a meeting of our executive committee held on March 21st, called for \$3,275, subdivided as follows:

Salaries	\$1,250.00
Traveling Expenses	250.00
Stationery and printing	500.00
Office expenses	300.00
Postage	200.00
Convention expenses	250.00
Contingent	250.00
Publicity convention reports	275.00
	\$3,275.00

Of this amount there has been expended to May 5th 875.19

Leaving (according to the attached) still to be expended the sum of \$2,399.81

It will be noted that cash on hand and due from parent association is more than sufficient to meet these requirements.

Your attention is called to the fact that the Association is still indebted in the amount of \$1500 to companies noted below, to cover advances made when the Association was formed:

Great Western Power Company.....	\$ 168.00
Los Angeles Gas & Electric Corporation.....	85.00
Pacific Gas & Electric Company	530.00
Pacific Light & Power Corporation.....	175.00
San Diego Consolidated Gas & Electric Company...	56.00
San Joaquin Light & Power Corporation.....	98.00
Sierra & San Francisco Power Company.....	72.00
Southern California Edison Company	260.00
Western States Gas & Electric Company.....	56.00
	\$1,500.00

Bank statement in verification of the above was attached.

PUBLIC POLICY

BY JOHN A. BRITTON

(Perhaps the most important event of the convention was the report of the Public Policy Committee, as given by John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, chairman of the committee. The many problems now confronting the electrical industry are here discussed with broad minded sanity and a most valuable and comprehensive program outlined for the coming year. Labor shortage, fuel shortage, the necessity for hydro-electric development and its means of attainment, rate increases and policies toward the education of the public which must necessarily accompany these, are considered in a way which met the hearty approval of the convention.—The Editor.)

Since the submission of its initial report by the Public Policy Committee, so many occurrences in the field of endeavor of public utilities have arisen of a serious nature that a report of ordinary character becomes at once an impossibility. The past year has been one fraught with complexities, not only in operation but in administration, but outstanding as the one result obtained during the year through the helpfulness of the Association and its members is a general change for the better in the relation of companies one to the other where geographical and physical conditions have made such closer inter-relations a possibility, and while it was but a suggestion, as contained in the report, the fact that it has been accomplished emphasizes the good that can be accomplished by organizations of this character. The full results that may be accomplished have not as yet been realized, but it is anticipated that because of the relations that now exist, the full extent of the recommendations made will during the coming year have full fruition.

True to the traditions of old, the public utilities have by their co-operative efforts with the government and its recognized agencies, in all of the demands made upon them, given to the loyal people of the United States a different perspective in contemplating utilities as such, and it is strongly recommended by your committee that a bureau be established, to act in conjunction with national bodies organized for that purpose, looking to the distribution of a propaganda calling for a fair consideration of the rights of utilities, and that the old and time-worn spirit of antagonism be forever buried and forgotten, that the public may be brought to the realization that in these times of our troubles, common to all, that the public utilities stand for all that the people stand for, and that under regulation the people are protected from profiteering by the utilities to a greater extent than the people are protected by the government regulation of all of the commercial industries and businesses.

We again pledge ourselves to that offer made at our last convention to the President of the United States.

While it has been possible during the progress of the war for every type of industry to obtain under the protection of the laws of the United States a commensurate profit upon their undertaking, public utilities have, in but few instances been permitted to absorb the increasing costs of labor and material, and while the Wisconsin Commission in a recent decision stated that public information had to be considered, and therefore dilatory measures were employed in determining the rights of utilities, the commissions on the whole have arisen to the fact that unless protected by some prompt and efficient action, the utilities would be forced into a position that, as expressed by the Comptroller of the Treasury, would be a calamity to the nation.

Our Association's problems, in order of their importance, are:

First—Necessary increase in capacity of plants.

Second — Necessity for rate increases.

Third—Financial aid.

Fourth — Increase in demand for power.

Fifth—Decrease of manpower.

Sixth — Co-operation in selling campaign.

Increase in Capacity of Plant

Added to the problem of meeting the war contingencies in the sudden growth on the Pacific Coast of industries not heretofore made a part of our industrial progress, and coupled with the intensive demands from our wonderful soils of the fruits of the earth, and the further necessity of the conservation of oil for governmental purposes, came the unforeseen climatic conditions that prevailed in the fall of 1917 and the spring of 1918, largely reducing the output of hydro-electric plants and forcing the necessity of increased production of energy by steam. This contingency, unlooked for and coming at a time when the companies were least prepared to take care of the situation, proved to be a not unmixed evil, for through the joint efforts of

Whereas, the future welfare of the Public Land States depends upon water power development to increase the location therein of industries, to which cheap and constant power is a necessity, and to further develop their agricultural possibilities; and

Whereas, true conservation consists in saving that which is destructible, such as our forests and oil and coal deposits, and using that which is indestructible, our falling water; and

Whereas, the immediate development of a potential power by water of not less than 100,000 horsepower per year would bring arid lands into bearing, provoke the development of industries utilizing the hidden wealth of the Public Land States, and build up an empire in the West; and

Whereas, the existing laws have prohibited the full development of the water power of these states; now, therefore, be it

Resolved, That the Pacific Coast Section of the National Electric Light Association, in convention assembled, urges upon the Congress of the United States to enact at once such remedial legislation as will encourage development of the millions of horsepower now wasting to the seas, that true and not false conservation may prevail, and that the waste of fuels in generation of electric energy may be minimized;

Resolved, further, that a copy of this resolution be forwarded by the president of this Association to the President of the United States, to the Honorable Secretaries of War, Navy and Interior, and to the Honorable T. W. Sims, House of Representatives.

the Railroad Commission and the Fuel Administration, there has been brought about in the state of California an interconnection of companies that it is safe to say could not have been accomplished otherwise than as a patriotic measure. It has thus afforded and created an appreciation of the economic advantages of centralization and unification, and a great and most potent saving of waste of capital and loss of energy in useless unrestrained competition. The results of the bringing together of the companies are to be found in the records of the Railroad Commission, and display in a very forceful manner the sacrifices that were made of individuality to accomplish the greater good to the nation.

The shortage of water for power purposes also brought out and strongly emphasized the need of congressional legislation to make the occupancy of public lands possible without such burdens as have heretofore been imposed, such burdens stifling added increments of water power and permitting the ruin and waste of natural power, and using up that same power in oil which should be conserved for purposes for which electric power is not available.

The Congress of the United States has now under consideration a bill for the leasing of public lands for power development, which bill, if enacted into a law, will materially help to unlock the doors which for years have been locked and have kept away the maximum possible development. The members of this Section should by every means in their power impress upon their representatives in Congress the necessity for the passage of some such legislation as will invite the expenditure of capital to produce power needed not only to meet the present and future demands on the Pacific slope, but to meet them under conditions that will prove the best from an economical standpoint for both the producer and the consumer.

Pending this much to be desired condition, the companies are doing their best by the distribution of available power jointly on each system, so as to produce the maximum efficiency of each plant as far as possible, and thereby the conservation of oil.

It has been estimated that in the territory of this state alone are 6,000,000 potential horsepower to be developed by the falling waters, of which not more than 1,000,000 horsepower have so far been developed, and with the growth existing of 50,000 horsepower per year and with but a fraction of the percentage of essential and necessary power generated by water power or steam power through central stations, a field is open which will do more to increase the population of this state and to bring its resources to the market than any other act that could be committed at the present time by the government of the United States. Surely this is a subject that is worthy of the most serious consideration of this Association, and your committee appends herewith a resolution which it recommends for adoption, and also recommends that copies thereof be forwarded to the President of the United States and the Secretaries of War, Agriculture and Interior, and also to the Honorable T. W. Sims, chairman of the Joint Committee of the House of Representatives, having under consideration the water power measure.

Necessity for Rate Increases

With the direct entrance into the war with Germany on April 6, 1917, by the United States of Amer-

ica, what had been to some degree an uncertainty prior to that time, became on that day a positive certainty—that all of the elements entering into the production and distribution of electric energy must rapidly increase in cost, and that the labor situation by reason of the demands of the government for the necessities of the war must likewise increase, and that therefore the prices previously obtained under general regulations, for energy, in the ante-war days, could not prevail and the operating companies exist.

Appeals to regulatory bodies were commenced during the year 1917 by companies which, as long as it was possible, forebore to apply for relief, anxious that their motives might not be misconstrued, and until it appeared that the capital invested in service to the public was facing absolute ruin if rates were not increased, appeals for relief were not made. In most cases the increases granted on preliminary applications were largely temporary, as the continued advances in price of labor and material could not be met by any action of rate-fixing authorities, so rapid were they in their character.

In his report to Congress the Comptroller of the Currency, John Skelton Williams—a name ever to be remembered in the history of public utilities—sounded the note of alarm and stated that—

"The breaking down of these corporations (meaning public utilities) would be a national calamity."

This view of the Comptroller was produced by the presentation to him of a report by a committee from the American Electric Railway Association, National Electric Light Association, American Gas Institute and National Commercial Gas Association, which report described in detail increases in cost, decreased net of operating companies, increases in investments to meet demand, and further the falling off in the market value of the securities of the utilities, and additionally emphasized the necessity for such action as would permit the refinancing of approximately \$152,000,000 of liabilities of companies that would presently mature.

The Secretary of the Treasury, taking official notice of the report of the Comptroller, on February 15, 1918, by letter to the President of the United States, recited the conditions confronting the public utilities, and the President on February 19, 1918, replied to the communication of the Secretary, and in which reply among other things he said:

"It is essential that these utilities should be maintained at their maximum efficiency and that everything reasonably possible should be done with that end in view."

On the Pacific Coast the increased cost of oil has been the most potent factor in increasing the cost of service to public utilities; from October, 1916, to date, the base field price has risen from 35c. per barrel to \$1.23 per barrel, and this has been all the more severe upon the electrical operating companies by reason of the greater demand made upon them for service and, as has been mentioned before, of the lessened hydroelectric output.

The average person never stops to think that if the service of the public utilities throughout the country should stop, the whole war program would instantly collapse. It follows that insofar as the efficiency of a public utility is impaired the war program is proportionately delayed and interfered with.

As illustrating the conditions of the companies: In some cases dividends have been suspended, others have been paid in scrip. In some cases even bond interest is already in danger and receiverships are threatened. Public utility credit is gravely affected and will soon be permanently impaired unless additional revenue can be very generally secured.

As a result of this depreciation in the credit of utilities and the extraordinary demands for money by the government, the market value of utility securities, as pointed out in the report of the Committee on Public Utility Conditions, has suffered a tremendous shrinkage. The securities of public utilities have long been a favorite form of investment for both small and large investors, savings banks, insurance companies and trustees, and are to be found as collateral for loans in every national and state bank. Their depreciation accordingly threatens our whole financial structure.

In this crisis it is most encouraging to note the helpful expressions from the president of the Railroad Commission of the State of California, made at a meeting held on March 6, 1918, before the University Extension Course, and from which we quote:

"In the situation which now confronts many of our public utilities, the duty of the State Commission is clear.

"While providing for the continuation of adequate service, it is their duty to act promptly and vigorously on applications for increased rates based on increased operating costs.

"Where the usual methods of rate making would result in unreasonable delays, short cuts must be applied to meet the emergency conditions.

"Our public utilities must be kept in a sound and healthy financial condition, so that they will be able to meet not merely the requirements of their existing patrons, but also the additional requirements of the war.

"The State Commissions should not wait until the utilities come to them with their pleas for assistance. It is their duty to inform themselves by their own investigations, if necessary, concerning the condition of the public utilities under their jurisdiction, and to keep themselves constantly informed.

"If the State Commissions rise to meet the situation, as they are doing in all sections of the country, they will be rendering a substantial service not merely to the utilities and their patrons, but also to the nation itself, which is largely dependent for war efficiency on the service of public utilities."

Financial Aid

With public utilities of our class there is a constant demand for capital expenditure, and expenditures that are aside from the large capital required in new plants, and that is the more or less insidious demand daily occurring to meet the ordinary applications for service, but which summed up in a year of operation amounts to vast sums of money.

The borrowing capacity of a utility depends in normal times upon its financial showing, and so the item of financial aid is intimately allied with earning power. Public marketing of public utility securities is today impossible, excepting by short term notes at prohibitive rates of interest. Congressional help, which is attempted to be given through the recently adopted Act of Congress, while affording some relief in refunding obligations, does not, because of the short term of loans by the government and the added fact that loans must be made only for enterprises directly con-

nected with governmental war activities, afford relief for permanent extensions to plant, which cannot come into full earning power for years and which cannot be directly allocated to war activities. The utilities must themselves then take care of the future, and in no more certain way can this be accomplished than by being permitted to earn such return upon their capital as will encourage the investor. Once the investor is made certain in his own mind of the strength of the securities offered to him by assertions of helpfulness on the part of those authorized to give such assurances, so certainly will money be forthcoming to aid and assist in the upbuilding of the financial part of the utility. With the certain knowledge which we now have that for many years to come after the war is over demands for rehabilitation and reconstruction will provoke such continued demands for public utility service, we can assert a guarantee of assurance that protective rates will provide the certainty of security for such obligations as may now be issued in public utility work.

At best the ability of the utilities to enlarge their facilities will, during the progress of the war, be reduced to a minimum unless this aid shall be forthcoming, and it is certain that without some constructive help, from the state commissions, there will be a curtailment of demands not deemed to be purely essential in the furtherance of our nation's work.

Increase in Demand for Power

There are in the states embraced in the Pacific Coast Section of the National Electric Light Association but two sources of power worthy of consideration. First, that produced by falling water; and second, that produced by steam generation.

This report has touched upon the necessity for further and more intensive hydro-electric development as intimately affecting the development of this area. Agriculture will always, in its many and varied ways, be the dominant pursuit; irrigation and reclamation as connected therewith the equally important ones; and there is perhaps no greater thing necessary to the successful outcome of the war than the products of the soil. We must find ways and means to meet these demands and prepare ourselves for the day that is to come when with the embargoes now existing removed, there will be a forward movement towards the realization of the dream of a state bus bar—yes, even a national one, as the most economical method to serve the needs of the people.

Decrease of Man-Power

When the need for men arose in answer to the demand of the country that this world by aid of its man power should be made safe for democracy, and when from every city, town and hamlet there went forth men to serve under our banner, the call came in strongest terms to the men of the utilities, for they were men trained already to the hour in organization, in technique; the young, the active, the energetic man, whose first thought was of service to country. He was the man who needed little or no preparation to bear the brunt of the battle roar; his engineering skill, his initiative, his mode and manner of living, all fitted him to take up the great work and carry it forward to suc-

cessful conclusion. This withdrawal of man power has proven to be the most serious handicap to the fullest economical administration and development of utilities, not only in the loss of such trained men but in the necessity for the substitution therefor of men untrained and unfitted by contact and environment to take up the burden of those who have enlisted in the ranks.

This labor situation is one which we must face with the greatest concern, not only in its immediate present by the withdrawal of the effective man power, but in the future with the probability of never again approaching the degree of efficiency that heretofore has characterized organizations of the character of ours.

Your committee fully believes that if the general public, always fair in its final conclusion, can be made to feel the true force and effect of the participation of utilities in the service of the government, and their unquestioned patriotism, that when and as questions arise between the utility and the public, greater consideration will be shown than has heretofore been the case. It is difficult for a layman to realize what an investment of millions of dollars means to the service of the public; difficult to make them realize that a dollar invested in public utility work is just as much entitled to the protection of the public as is the dollar of a layman invested in any enterprise in which he has a direct and personal part, and that the same high ideals that prompt the citizens of this country to make sacrifices at this time for the benefit of the land they love, are those that prompt the public utility men—from manager to laborer—to be placed in the same class and be recognized as an integral part of our nation.

Aside from the giving of service by the depreciation of this man power, the utilities have been called upon constantly to render aid and assistance to the various branches of the Federal government, notably in connection with the Fuel Administrations of the several states; the enlisting of men in aiding the Department of Justice in its many ramifications; in all Red Cross work, and in the sale of Liberty Bonds. At no time has there been found lacking the necessary sacrifice of time and labor to make all of these governmental agencies effective, and the men of the public utilities have deemed it an honor to be classed as dollar a year men.

Perhaps one of the blessings in disguise occasioned by the war has been the necessity brought home to the public utilities for economizing in all of their departments by the elimination of unnecessary operation and by reducing so far as they can, through automatic devices and otherwise, the necessity for man power. Your committee has found upon investigation that every effort possible has been made by the public utilities to conserve men and material and to aid the Public Utility Commissions to reduce to a minimum the necessities for the rate increases.

One of our writers on economic subjects, in an article discussing the question of hydro-electric power in California, makes the following interesting statements:

"In California alone, the demand for energy of all kinds is increasing at least 10 per cent annually. If this annual rate

of growth is reduced to 5 per cent and the production of fuel oil is increased to 105,000,000 barrels annually, it will require the development of 1,500,000 kw. of additional hydro-electric power during the next ten years to supply this increase in demand. With the necessary transmission and distribution facilities it will require an investment of \$500,000,000 to effect such a development. Such an increase in hydro-electric installation will provide power for industrial plants with over 5,000,000 horsepower, with an output capacity of \$1,000,000,000 annually and with employment for 250,000 men. It will add over 1,000,000 to the state's population and \$3,000,000,000 to its wealth. It will quicken every phase of economic activity, strengthen every material resource, broaden the opportunities of every individual within the state, and give confidence and stability to industries vitally important to our prosperity. Without it we must remain stationary for the present, and with the exhaustion of our precious and limited petroleum deposits, and standing timber, steadily but surely fall behind."

Co-operation in Selling Campaign

The efforts made by the manufacturer, jobber and dealer at the last annual convention to secure recognition by the companies has been productive of results, and the trial now being given will demonstrate the effect of such co-operative work—if it leads only to a mutual understanding of the relations between the several parties in interest, including the consumer, the test will be worth while—and the ultimate person to be satisfied, the consumer, will have not one but all agencies working to give him perfect service, which is the only true and correct principle—and the resultant gain, by acquisition of the good will of the consumer, to all participants in the co-operative work, will be like the effect of the pebble thrown into the still pool; the undulating waves will in their continual widening of action, reach to the uttermost shore. Public utility men are not natural salesmen, they provoke the field only, and the trained dealer knows intuitively the prospect and its possibilities, and with fair dealing and true co-operative effort, he should be the business builder for the utility—standards fitting each utility's possibilities being his aim, and continuance of interest in his customer, even after the utility has taken up the burden of service.

Your committee recommends that member companies extend every possible aid and assistance to the jobber and dealer, in order that a full, fair and comprehensive trial be given to the plan of co-operative work in sales of appliances, that it may be finally determined on its merits, and set at rest the moot question, as to the best method of increasing sales and promoting friendly relations between seller and buyer.

Taxation

The question of taxation, always a vexed one, is bound to assume greater magnitude during the coming year, and although the fallacious argument is used that burdens of the same are passed on to the consumer, the fact remains that any undue burdens of taxation must be absorbed out of the net of each company; and it also is in the interest of an economical state administration, that taxes should be kept at as low a rate as is possible. Steps should be taken by all members of this Association by such means as lie within their power, to resist further advances in an already heavy rate, by such alliance with other organizations as will tend to maintain taxes, on a parity with other property, and to reduce the onerous burdens that public utilities are now forced to carry.

WAR SERVICE ENGINEERING PROBLEMS

(Few more important discussions have ever taken place in the history of electrical achievement in the West than that which developed at the engineering sessions of the Pacific Coast Section, N. E. L. A., convention at Del Monte. A portion of the first afternoon's meeting alone is included here, the remainder to be given in the next issue of the Journal of Electricity. The important contribution from D. M. Folsom on the present fuel oil situation, and the comprehensive paper by L. S. Ready on the hydro-electric situation in California, as viewed by the Railroad Commission, are both vital contributions to the problems which confront the industry in the West, and brought forth much that was interesting in open discussion.—The Editor.)

The first session of the Engineering Section, under the chairmanship of J. E. Woodbridge, was devoted to a consideration of the several vital problems that face the electric light and power companies as a result of the war. This was introduced by the engineering committee's report (p. 400, April 15th issue, Journal of Electricity).

Report from Northwest

The chairman read a telegram expressing the regret of Geo. E. Quinan, chairman of the engineering committee of the Northwest Electric Light and Power Association, at his inability to attend the meeting, and announcing that the association would be represented by F. D. Nims of the Washington Coast Utilities Company of Seattle, and H. H. Schoolfield, electrical engineer for the Pacific Power & Light Company of Portland.

Mr. Nims and Mr. Schoolfield told of the common interests of the two associations and also explained a few of the conditions peculiar to the Northwest, including the use of powdered coal and hogged fuel, results that have already been accomplished as regards tying-in of transmission lines, and the general use of turbines instead of impulse wheels. The power requirements of the shipyards have in part been met by improving the diversity factor through arranging different times of starting shifts at work.

Water Power Discussion

F. H. Fowler, district engineer for the Forest Service, and consulting hydro-electric engineer for the U. S. Fuel Administration, gave a lantern-slide lecture on "Possible Water Power Developments in California, Nevada, Arizona, and New Mexico." This graphically displayed the necessity for new hydro-electric development because of the shortage of fuel oil, and briefly analyzed a number of feasible water power developments. The paper will be subsequently published in full in these columns.

The discussion on Mr. Fowler's paper was combined with that on H. A. Barre's paper on "Power Resources in Southern California" (p. 330, April 1st issue, Journal of Electricity), and "Joint Operation of Power Companies" by J. P. Jollyman (p. 402, April 15th issue, Journal of Electricity).

H. F. Jackson stated that three years ago the proper proportion of installed steam relay capacity to hydro-electric capacity was 20 per cent and asked if that ratio still held. F. H. Fowler cited the satisfactory operation of the Pacific Light & Power Corporation with a 15 per cent ratio. C. O. Poole of the Southern Sierras Power Company stated that the cost of fuel was the determining factor to be taken into consideration, and that 20 per cent was far too high under present conditions. F. H. Fowler stated that no general rule could be adopted, each system constituting an individual problem.

Shortage of Fuel Oil

D. M. Folsom, Federal Oil Director for the Pacific Coast, contributed the following important information:

It is a well-known fact that the consumption of California oil has been in excess of production for two and a half years; but the seriousness of the present situation is not thoroughly appreciated by oil consumers. A complete survey of the commitments and resources of all the marketing oil companies in California, made in the last month, has developed the fact that the present available supply of fuel oil will be entirely exhausted within a year. This is based on the assumption that the present ratio between production and consumption will be maintained; and also on the assumption that it will be possible to pool all the stocks and transporting facilities. In other words, this is the most favorable picture, and a critical period may be reached in much shorter time than one year, by reason of a decline in production or an increase in consumption.

As indicating the possible decline in production:

Jan. 1, 1916—Approximately 6500 producing wells; average daily production, 37 barrels.

Jan. 1, 1917—Approximately 7300 producing wells; average daily production, 35 barrels.

Jan. 1, 1918—Approximately 8200 producing wells; average daily production, 32 barrels.

These figures show the annual decline in the daily production from individual wells, and show the necessity of intensive drilling to maintain production.

As the most productive oil lands in the state are now involved in litigation, and therefore not available for drilling, the opportunity for increased production is limited to two relatively small fields in Southern California. The figures of the State Mining Bureau show that during 1917 approximately 1000 new wells were started in California. During the first four months of 1918 only 200 wells were started, indicating a decline in drilling operations of about 40 per cent. This will undoubtedly be reflected in a decline in production during the latter half of 1918.

In as much as approximately 85 per cent of California oil is used for fuel purposes, a shortage in oil will be immediately reflected in the curtailment of all the industries on the Pacific Coast. At the present time it is proposed to classify these industries according to a priority list which will be issued in Washington by Presidential proclamation. Under this priority list, the railroads, ships and other public utilities will receive preference. Following this, will come shipyards, munition plants and industrial organizations operating directly on government orders; and, finally, all other consumers will be grouped in a class which it is expected will be curtailed within six months. This curtailment will apply particularly to consumers served by tank steamers. In view of the seriousness of the shortage, it is not at all improbable that in 1919

many industries in California, which now are supplied with oil, will be forced to shut down or to obtain power developed from hydro-electric sources.

The convention may be interested to know that in the proposed priority list, although public utilities are given a preferential position, this applies only to service to consumers who would be entitled to oil by the priority list. In other words, it would be impossible for any industry, which is unable to get oil, to substitute for it power generated from steam, and it will probably be impossible for power companies to secure oil for carrying such part of peak load as is made up of non-essential lighting. Under the provisions of the Lever Act, which governs the operations of the Fuel Administration, the marketing oil companies are required to take out a license; and this license will prohibit them from selling oil, except under the priority list, so that the burden of proof for service will be thrown upon the power companies before they can receive oil from the marketing companies.

The Hydro-Electric Situation in California

L. S. Ready, acting gas and electrical engineer for the Railroad Commission of California, read the following discussion:

The Railroad Commission of the State of California has been and is vitally interested in the power problems confronting the electric utilities of the state. These problems are in many ways as much the commission's problems as the utilities'. We must all be actively engaged in meeting and solving the war problems with the object of winning the war.

It is the commission's desire that nothing be left undone that will make possible the adequate supply of the necessary power which the electric utilities are and will be called upon to furnish to the industries in this state in order that they may not fail to do their part in winning the war, due to lack of the power that is so essential.

A large area of the state is dependent upon the electric utilities for the production of crops, and at this time that area is materially increasing and the demand for power is becoming greater than under normal conditions. The shortage of rainfall which exists this year, and the demand for extra production of crops due to food shortage combined, means that power will be used to a greater extent than ever before.

The growth of industries, especially the shipbuilding, has been rapid, and although the utilities are not today soliciting business, they are finding that to supply the demand of those who apply is causing an equal or greater increase than in past times they could obtain by strenuous solicitation.

The real question to be solved by the financiers is the obtaining of the necessary moneys for further developments and extensions to meet the requirements. The problem of the engineers consists in increasing the efficiency of the existing systems and the joining together of the different systems with the co-operative operation of them so that every kilowatt hour of energy that can be obtained may be utilized at the highest efficiency practicable, and further, the construction of more and larger plants to meet the growing requirements.

In 1917, F. Emerson Hoar, gas and electrical engineer of the Railroad Commission, now captain in the U. S. Engineer Corps, commenced investigation with view to determining what could be done to increase the output of the electric utilities, special attention being given to those companies in the central and northern part of the state in order that the prospective demands then before the companies might be supplied with the least increased use of fuel oil.

Special studies were made of the latent possibilities of the developments of the northern companies and the various projects which might be developed most quickly, and later studies were made of the possible conservation which might be obtained by more complete interconnection and utilization of existing facilities. As the study developed it appeared that, with a steady growth of business the utilities were rapidly reaching a point where further increase of load would mean almost a proportionate increase in the use of fuel. The existing hydro-electric plants which could be used with the systems as operated, or even with complete interconnection, would not supply much additional power.

Realizing this fact, and desiring to assist as it might, the commission instituted, on its own motion, an investigation into the construction and operation of the electric utilities of the state, so as to enable it to determine the special needs of these utilities during the war emergency and in order to enable the commission to render assistance to the government, the utilities and the public, to the end that there would be no shortage of power on the part of the utilities and no shortage of service to industries in California.

As most of you are aware, these investigations brought out many important facts and the commission has issued two recommendatory orders recommending certain interconnections and additional construction by southern utilities, and in the north the transmission of power from the California-Oregon and Northern California Power Companies' systems to Pacific Gas & Electric Company.

Many of those here are familiar with the conditions, but a review of the general facts may be of interest.

Dividing the state into two general divisions as regards the production and transmission of electric energy, one covering that territory in the southern San Joaquin Valley and Southern California, which may be designated as the Southern Division, and the Northern Division constituting territory served by electric utilities in the northern and central portions of the state, we have, if we neglect the separate ownership of properties, two large production and transmission systems whose loads and output are closely equal.

The Southern Division's requirements for the year 1917 showed a total simultaneous peak load of 230,000 kw., while the northern companies exceeded this amount, reaching approximately 260,000 kw. The output for the year 1917 in the Southern Division was approximately 1,150,000,000 kwh. as against 1,500,000,000 kwh. for the northern systems. Approximately 18 per cent of this energy was produced in steam electric plants utilizing oil to the amount of 2,500,000 barrels.

Estimates have been presented to the effect that if all plants now constructed be operated to full

capacity and the further advantages of interconnection be obtained, that during the present year the amount of oil used by the electric utilities, even with the increased output, could be kept approximately the same as that in 1917, under normal conditions of rainfall.

We are, unfortunately, faced with a condition which will require a greatly increased use of oil for the production of electric energy during this year. The snowfall in the mountains is less than that occurring in 1917, and considerably below normal. In the northern portion of the state the precipitation is slightly in excess of one-half the normal rainfall at this time, while in the southern part it approaches nearer normal conditions.

It is difficult to state what the oil requirements of the electric utilities will be during the coming year, but from information so far obtained, the requirement will approach four million barrels, or possible exceed that amount.

We are faced with lack of capacity for some time to come. It will be at least five years before the Pit River development of the Pacific Gas & Electric Company could be completed, and consequently the less complete but more rapid development of the same stream proposed by the Northern California Power Company might be the more feasible, especially if the Feather River project cannot be financed. The combination of the two companies might make this possible. The less complete development might be later replaced by the fuller utilization proposed by the Pacific Gas & Electric Company and the loss amortized over a period of ten or fifteen years.

Difficulties of financing the larger developments may require the immediate development of several projects of from 30,000 kw. or less, including one on the lower Pit River, the Oro plant of the Great Western Power Company, the proposed development of the Pacific Gas & Electric Company below the Drum plant, or the addition to the Sierra & San Francisco Power Company's plant, for which the bond issue has already been authorized by the commission.

The Los Angeles Aqueduct plants will be very valuable in oil conservation if constructed as they have been planned for. Their daily load factors of 40 per cent make them especially valuable for supplying the load requirements and supplementing the hydro-electric power transmitted from long distances and supplied at load factors above the requirements of the system.

Besides these there are numerous others which can be developed and which will in time be constructed.

The emergency conditions in the supply of power facing the electric utilities in the state at the present time are due to three causes:

1. The early hydro-electric plants are fully loaded and only slight increase in output will occur under normal conditions from the existing plants and practically no surplus exists.

2. The precipitation in the mountains is considerably below normal, especially in the northern part of the state, thus resulting in a reduced available supply of hydro-electric power for the year 1918.

3. The need for the conservation of fuel oil, which is becoming more necessary each month, and the absence of new developments under construction or which may be constructed in less than one or two years time.

Mr. Fowler has placed before us vividly the wealth in power which it is possible to develop in California and the Western states. This shows that there exists in the mountains latent possibilities of power development which will more than meet the needs of the utilities of the state for a long period to come, not only to supply the regular and growing needs of the electric utilities as they now exist, but in furnishing power for the electrification of railroads. These public utilities are at present utilizing 40 per cent of the total oil production of California, while the public utilities such as gas and electric, etc., use only from 10 to 15 per cent of the total production.

We must not consider, however, that because the electric utilities of California utilize only from 2½ to 5 per cent of the oil produced in the state that what we can conserve is of little importance. The percentage is small, it is true, but to the electric utility there is a substitute not available to other oil users. It is true that even at the present price of oil, hydro-electric plants cannot be economically utilized to eliminate the oil consumption by electric utilities entirely. The electric industry must, however, do its share of the conserving, not only in proportion to its own use, but must, I believe, assist its sister utility, the gas company, which in California, especially under present conditions, has practically no other source of crude product for the production of gas. The gas utilities in 1917 consumed 2,220,000 barrels.

The growth of electric demands in California in the northern and southern districts previously referred to has, during the past year, been at the rate of approximately 25,000 to 30,000 kw. and approximately 150,000,000 kwh. per annum in each district, and it appears that this growth will continue or possibly increase at a greater rate owing to the increased price of fuel oil and other power producing fuels, as well as increasing demands. To meet this demand and not greatly reduce the use of electricity to non-essentials, and to prevent the rapidly increasing use of fuel oil, will require additional plant capacity of approximately 100,000 kw. in the state each year.

At present there is practically no construction work in progress for the building of additional hydro-electric plants, and the quickest that can be made will require at least 12 months, although some small increase to various utilities can be obtained in shorter time by prompt action and some economies made on existing systems. We are, however, behind in the developments, some estimating as much as two or three years. This is due not only to lack of construction within the past year or so, but to the increased price of fuel oil and demand for conservation which has made it economical to have a larger percentage of hydro-electric capacity than formerly.

War Finance Bill

R. H. Ballard briefly summarized the provisions of the War Finance Bill as applied to public utilities. Seven-eighths of the authorized bond issue of three billion and the capital of five hundred million dollars to be contributed by the government and eventually sold to the public through bond houses, will be loaned through the banks. To secure 100 per cent advance, the banks must deposit 133 per cent in securities

backed by their personal obligation. One-eighth of the capital, about \$437,000,000, will be allotted to going concerns whose business is necessary or contributory to the conduct of the war, 125 per cent of the loan being deposited in the form of securities. It is a question yet to be decided whether public utilities will come under the latter category, though the dependence of all industry on electric power will at least entitle central stations to secure the necessary capital through the banks.

Hydro-electric development will enable a large saving in fuel oil greatly needed for shipping. It is estimated that 16 per cent of the entire oil production of the nation will be required by the 300 destroyers to be built, and 25 per cent by the merchant ships and the navy. This should convince both the Shipping Board and the Fuel Administration of the necessity of new water power developments.

Much power is also required to irrigate land used to raise foodstuffs, a factor of interest to the Department of Agriculture, which supervises the production, though not the distribution and consumption of food, the latter function being controlled by the Food Administration.

The War Industries Board has the duty of finding locations and facilities for munition and shipbuilding plants and also censors orders for equipment going to non-essential industries. On the Atlantic seaboard there is an estimated shortage of 800,000 horsepower for strictly war industries, and it is possible that 250,000 horsepower of equipment now on order for ordinary requirements will be taken over by the board. California's example in the interconnection of power systems, both steam and water power, will undoubtedly be followed.

Thus there is hope that the \$90,000,000 needed to develop from 600,000 horsepower in California may be obtained through these channels, especially as the formation of the War Finance Corporation followed McAdoo's suggestion for public utility needs in refunding old issues and providing capital for new construction.

H. F. Jackson asked that further discussion be contributed on the subject of steam relays.

P. M. Downing of the Pacific Gas & Electric Company, pointed out that, great as is the importance of saving oil, even greater is the problem of meeting the demand for power until additional hydro-electric capacity can be installed. There is an abundance of potential water power awaiting development as soon as capital is available. New hydro developments have not kept pace with the increase in load for several years past because the investment has been made so unattractive to capital. The oil shortage merely accentuates the water power shortage.

As five or six years will pass before the larger developments can be completed after capital is made available, work should be started on the smaller projects as soon as money is provided through government aid. These should be rushed to completion as rapidly as possible. What little advantage is being gained by interconnection is only temporary and any further curtailment in fuel supply will compel that some of the present power load be dropped.

John Hood of the General Electric Company discussed the fuel saving that would be accomplished by railway electrification. The efficiency of a steam locomotive is one-third that of a steam electric power plant; one-tenth of the locomotive's power is employed to haul the fuel it burns; over congested roads a steam locomotive can move only half the traffic that can be handled by an electric locomotive. The electrified road has proved its economy in terminals, tunnels, and especially over mountain grades where an abundance of hydro-electric power is close at hand. Our unpreparedness for war has been paralleled by our unpreparedness as regards railway electrification. Definite steps should be taken to remedy this situation wherever electrification is feasible, as thereby a greater fuel saving can be effected than by correction of any other single factor.

S. J. Lisberger urged that every possible small economy be practiced during the two years that will pass before even the small projects can be completed—that daylight saving be extended throughout the entire year, that steam economies and heat insulation be adopted in steam power plants, that radiators be turned off instead of windows opened when rooms are too warm, and that every effort be made to conserve oil.

E. A. Quinn of the San Joaquin Light & Power Corporation told of economies effected by the interconnection of his company's lines with those of the Mount Whitney Power & Electric Company. Ed. Whaley, Northern California Power Company, and W. M. Shepard, California-Oregon Power Company, likewise described how the interconnection of these two companies is to be accomplished. The building of a 95 mile tie-line will supply 8000 to 12,000 kw. from the Copco plant to the northern territory and release power for delivery to the Pacific Gas & Electric Company at the southern end of the Northern California Power Company's lines. The cost will be about \$750,000, which will virtually transfer 8000 kw. 230 miles with transmission losses not to exceed 16-18 per cent.

E. R. Northmore of the Los Angeles Gas & Electric Company deplored the use of 50 cycle equipment by the Southern California Edison Company and the Los Angeles Aqueduct plant when 60 cycles has been selected as the standard throughout the rest of the state. He suggested that, since this difference would not be tolerated if all systems were under one management, it be changed so as to meet the necessities of the present emergency.

C. O. Poole of the Southern Sierras Power Company approved of this suggestion, though the difficulty is partly mitigated by the beneficial condenser effect accomplished by the installation of synchronous motor driven frequency changer sets. The practice of changing generator speeds to vary frequency entails too great a loss of efficiency.

H. A. Barre of the Southern California Edison Company made the point that a steam plant, as a part of a hydro-electric system, has two main functions. The first is to carry the peaks which cannot be carried by water power because of the tremendous idle investment necessary to provide power for only a short time.

The second is to carry the base during periods of low water. The steam plant also carries a growing load until it can be capitalized in the construction cost of hydro-electric development. Mr. Barre thinks that future fuel requirements of the Pacific Coast will be met by Alaska coal, thus conserving the oil for more valuable purposes. He forecasted a great industrial development based on the development of iron ores in California smelted with Alaska coal.

He pointed out that the immediate development of Los Angeles Aqueduct power and the Kern River No. 3 plant would respectively add 100 million and 180 million kw. hrs. annually within two years time. He urged the necessity of starting these developments at once.

J. P. Jollyman stated that interconnection of power companies has minimized power waste in

Northern California. Money costs have been subordinated in order to obtain maximum utilization of available power.

Max Thelen, president of the Railroad Commission of California, extended the greetings and sympathetic interest of the commission in the proceedings. He appreciates that the power shortage problem is mainly one of finance and expressed confidence in the outcome.

Friday morning's discussion carried with it some vital hints for the conservation of fuel and water, as well as minimizing transmission and distribution losses. The point was made that steel conductors are likely to permanently displace copper in the future. There was considerable contributed discussion on standardization of insulators and insulator deterioration.

CONTRACTOR-DEALER AND JOBBERS SESSIONS

PACIFIC DIVISION, ELECTRICAL SUPPLY JOBBERS ASSOCIATION

At an open meeting held the afternoon of May 7th, to which contractors and manufacturers were invited, much of interest was brought out. A paper by J. J. Gibson, manager of the retail supply department of the Westinghouse Electric & Mfg. Company, from Pittsburg, proposed a single order selling plan which provoked considerable discussion, during which the various viewpoints of the jobbers on the Goodwin plan were expressed. Further routine business concluded the meeting.

CALIFORNIA ASSOCIATION OF ELECTRICAL CONTRACTOR-DEALERS

The California Contractor-Dealer Association days at the joint convention were crowded with developments of much importance to the future welfare of the contractor-dealer.

At the Wednesday afternoon session, which was in reality a continuation of the adjourned quarterly meeting held at Sacramento last January, the members after listening to a most frank and detailed exposition of the National Association of Electrical Contractors and Dealers, its aims and accomplishments, voted unanimously to join the National Association as a state organization, the action of the meeting of course, being subject to a referendum vote of the entire membership.

The present officers were voted to hold office under the new constitution and by-laws until the end of the present calendar year. J. W. Redpath, the present secretary-treasurer, was unanimously re-elected to that office.

Thursday morning was given over to an open meeting to afford the motor dealers an opportunity to meet with the manufacturers and jobbers for a mutual consideration of the problems affecting the motor industry.

The margin of manufacturers is small, it was shown, and even if they would it is probable that they could not legally combine to raise the price, so ways and means of increasing rate of turnover and volume of business were suggested; studying requirements in

special lines such as the printing trade, woodworking shops, was advised. Purchasers will prefer dealing with local men rather than manufacturers if the former render service. Motors should not be sold to get wiring jobs and the awarding of agencies to unscrupulous dealers was also condemned. Chairman Frank J. Somers, San Jose, went on record as opposed to any more closed meetings.

Among others who spoke were:

R. A. Balzari, Westinghouse Company, San Francisco.
W. S. Berry, Western Electric Company, San Francisco.
A. J. Myers, Wagner Electric Company, San Francisco.
P. H. Affolter, Garland-Affolter Engineering Company, San Francisco.
F. S. Thomas, Valley Electrical Supply Company, Fresno.
C. L. LeMoree, Westinghouse Company, Los Angeles.
C. F. Butte, Butte Engineering and Electric Company, San Francisco.
C. S. Renwick, Richmond.
Frank E. Doerr, San Jose.

T. E. Bibbins, Pacific States Electric Company, San Francisco, urged that dealers get together and agree on improvements desired in the present plan. Manufacturers would welcome a uniform plan, he said, but while all sections of the Coast demand different action no changes whatever could be expected. These were, in fact, the sentiments of the meeting. Manufacturers were asked to appoint a representative committee and the dealers decided to do likewise in order that uniform plans might be agreed upon and steps taken to put them into effect.

A session devoted exclusively to the interests of motor men proved so helpful that a permanent motor section was suggested. Papers on motor sales were presented at this session by:

F. W. Buzzell.
C. E. Ingalls, San Francisco.
H. P. Courtright, Fresno.
F. E. Boyd, General Electric Company, San Francisco.

The chief topic was relations between manufacturer and agent and how to build up motor business.

In answer to the complaint that the motor business did not pay, Mr. Boyd affirmed that it did pay if properly managed.

DISCUSSIONS ON RETAIL SELLING PRACTICE

(Much that was worth while in practical suggestions was brought out in the Commercial Section sessions at the Pacific Coast N. E. L. A. convention. A lively and valuable discussion on the paper "Retail Selling Practice" occupied the major part of the Friday morning discussion, and is reported here. The entire program could not here be included, owing to lack of space, but will be continued in the June 1st issue of the Journal of Electricity.—The Editor.)

COMMERCIAL SESSIONS

The commercial sessions were held on Friday under the direction of Chairman R. M. Alvord, who, in his introductory remarks, recommended that the selling force of the industry be devoted to placing electrical equipment and service in those places where they will release labor, fuel and money that can be used to help win the war.

RETAIL SELLING PRACTICE

L. H. Newbert of the Pacific Gas & Electric Company abstracted the paper on "Retail Selling Practice" (p. 351 and 412), tracing its four divisions: (1) the store, its location, rent, arrangement and management; (2) the cost of doing business; (3) selling methods; (4) advertising.

J. C. Rendler of the Southern California Electric Company of Los Angeles contributed the following written discussion:

While I believe that the gentlemen who wrote this paper are sincere, I think in their desire to make it look good on paper, they have exaggerated the conditions in some instances. I believe in these papers everything should be painted in its natural color. That is what I have done as it appears to me, and I trust that in any criticism I may make, the authors will not take it as being personal.

Retail selling practice naturally begins with the store, and as the store is the first subject on the paper, the store will be the first to get the bayonet. The general suggestions for location are beautifully written and probably applicable some place in the United States or in the world, but, from the writer's experience in California, they are decidedly impractical. I have never seen an electrical dealer who has made a success or even started on a fair road to success in the shopping district, and I have seen quite a number try. The cost of operating a "specialized business" with its limited gross business, is from 30 to 40 per cent. The department stores do business on a smaller overhead on account of their large volume. If some mathematician will show me the rule whereby an electrical dealer can rent a store in the best shopping district, with the rent, furnishing, help and other luxuries that go with the location, and help to build that 40 per cent overhead, and can make a success of it when the maximum discount allowed by the manufacturers of electrical devices is but 30 and 7 per cent on all of his principal lines, then I will confess that two and two do not make four.

If you try to locate in the shopping district, you are naturally near a department store, who, with its full page ads appearing daily in the newspapers in the same place, have educated the women buyers to look for their announcements. With only a small corner of that full page devoted to electrical appliances they can draw all the business away from the dealer who can not afford to spend enough money for advertising to counteract the ads of the department store.

While on the subject of the department store, let me say I do not believe they should have a place in the Contractor-Dealer organization. I further believe if the contractor-dealer is to become a factor in merchandising, he must be given an opportunity to grow, and grow he never can, so long as department stores, hardware stores, drug stores, and grocery stores are considered the proper channels for the distribution of electrical appliances and devices. Another reason why the dealer has never grown to his proper proportion is the power company, although there has been marked improve-

ment along this line during the past year, and this meeting is further indication of what is yet to come.

Getting back again to the cost of doing business, we see a list of fourteen rules recommended for figuring cost and profits. Eleven of these rules deal in figuring your cost; number twelve tells you to prove it by your books, and thereby know your cost of doing business for the year; number thirteen says to deduct this percentage from any article sold and find out whether or not you made a profit on that particular article. And then number fourteen — here is the real thing. Go over your several articles and put the selling price on a profitable basis. Again I say, how can the dealer do this, when the manufacturer fixes the retail price, advertises the retail price, and says to the dealer: "You get 30 and 7 per cent discount from those prices." Imagine a dealer asking \$5.50 for an electric iron that appeared in the Saturday Evening Post at \$5.00 and underlined "for sale at all electrical and hardware stores."

Stock turnover and perpetual inventory are two very great essentials in the conduct of a business, and their use should be very highly recommended. However, to keep these two files correctly will require one or more persons on the overhead, according to the amount of business done. In these days of conservation, the elimination of non-essentials, and the ultimate winning of the war, which must and will be done, it behooves the dealer to watch very carefully all items of overhead.

Selling Methods—I would imagine the suggestions under this heading to be for the benefit of beginners, as they deal with the A B C's, but since the electrical dealer generally is considered a beginner, the suggestions are very appropriate. I find the dealers in the territory I hail from practicing all the modern merchandising features that are practiced by any merchant in any line of business, large or small, and I believe a few features that nobody else ever thought of.

I was very glad to see the paper contained some practical suggestions on advertising, as I believe every dealer is more interested in this phase of merchandising because it is so much more difficult to see returns from it than from his window or direct solicitation. I would like to see the dealers of the state compile a record for a given period of time, say one year, in which to determine a fair average of expenditure for advertising on a given volume of business. I understand this information is available in other lines of business, but I have no knowledge of anything of the sort having been done in electrical merchandising. It is a lamentable fact that thousands of dollars are thrown away on advertising each year, simply because the copy was poorly written. There are advertising experts in nearly every city who will write your copy for a very nominal fee, and make it draw where you couldn't get a nibble.

Another thing these experts do is to make it easy for you to turn down unprofitable mediums that run you to death. Simply tell them John Doe handles your advertising and they will have to see him—and he does the rest.

In closing, let me say the electrical dealer (given an opportunity) will make a place for himself in the merchandising field that you will be proud of.

H. W. Kimball, contractor-dealer of Oakland, Cal., disagreed with Mr. Rendler, arguing that a good location is the best salesman you can have on the job. He welcomes the enlightened and fair competition of department and hardware

stores. He believes that the establishment of electrical specialty stores in the retail district will discourage the department stores and other from handling electrical business. He allows only 2 per cent of his sales for advertising.

J. C. Holbrecht, electrical dealer of Sacramento, likewise disagreed with Mr. Rendler. However, he wants specific information on the proportion of gross sales that should be allowed for rent. He would tie-in and benefit from department store advertising by showing in his window exactly what the department stores show in theirs, and at the same time.

C. E. Ingalls of the Crocker-Wheeler Company contributed the following:

This paper has given us some very practical points on the selection of the location of a store. Having determined the block in which the store is to be located, there is, the paper says, sometimes a choice of location within that block. I would point out a few rules that would prove of value in choosing between different sites.

The value of a corner lot is a question much debated by expert real estate appraisers. The simplest, reliable rule is the Lindsay-Bernard rule, which is as follows:

Figure the value of the lot as an inside lot on the main street. Then find the value as an inside lot on the side street. The sum will be the minimum value of the corner lot.

In choosing between two lots of different depths, there can be used any of the several authoritative so-called depth curves. The simplest rule, however, is a rule used by New York City assessors. It is called the 4-3-2-1 rule. The rule is that the front one-quarter of depth is worth 4/10 of the total. The next one-quarter of depth is worth 3/10 of the total. The next one quarter is worth 2/10, and the rear one-quarter is worth 1/10.

Sometimes it is difficult to determine the value of an irregular lot; for example, an "L" shaped lot, by which I mean a lot made up of a regular lot, with the addition of the rear of the adjoining lot. This value can be determined by valuing the regular lot, and adding to it the value of the rear, as determined by the 4-3-2-1 rule.

Another case is a lot that is all or in part a triangular lot. Here the rule is that the triangular part has the value of a rectangle of depth equal to one-half the altitude of the triangle.

The strongest side of the street tends to be that backed by the best residence district. Also, the south and west sides tend to be more valuable.

Streets running at acute angles make long crossings, which are detrimental to store properties.

Lack of continuity is detrimental to stores.

Traffic tends to be weaker in long than in short blocks.

Street cars are beneficial to store streets, except to fashionable shops.

Louis Levy, electrical dealer of San Francisco, contributed the following:

In the discussion of a paper of this kind, it would require considerable more time than I have given me, to tell the different items that I might agree or disagree with.

The paper or report as a whole is one that every dealer, whether large or small, would be well repaid by reading, but the trouble with us dealers, when it comes to a matter of this kind, is that we "are too busy, and haven't got the time," and it perhaps applies to myself as well as to others in the business, for, while I read both issues of the Journal containing the printed report, it was not until I knew I was to talk on this report that I read it carefully enough to appreciate how much real information it contained.

The section on "Cost of Doing Business" interested me more than any other section, and it is on this part of the report that I will confine my few remarks.

I do not find it practical to keep a perpetual inventory, in detail on cards, as suggested, but I do figure cost on every sale and piece of work done and at the end of the month am in a position to say what my stock is worth in total—dollars

and cents. I have tried the cards for the movement of stock but found that the added cost of labor did not justify the information received, and as I check every invoice before it is paid, so as to follow the purchasing of the goods, I feel that a business of less than \$50,000 a year is not big enough to carry this item of overhead.

I find that there are a number of items in my stock that are necessary to have so as to live up to the reputation of having everything electrical, and it is not practical, just because some items do not turn over every four months or so, that they should not be carried. For instance, Christmas tree outfits and lamps. I always have some on hand, and during each year have a limited call for them and I would not feel justified in selling out completely on December 26th. The same applies to fans. While we never have a large demand for them, we always have a few all through the year.

It must be remembered that the dealer is not in a position to make the resale price of the goods which go to make up the volume of his sales. These prices are made by the manufacturer and our problem is how to increase sales with a minimum of overhead. My overhead in March was 0.332, and my records show that in April, May and June it runs higher. My problem is now "how to increase sales with my present force," not to increase my force to increase my sales. My cash sales last year in these three months numbered 700 per month of 95c. each. The number of sales was below the average of the entire year, which was 935. The amount of each sale was the same.

To my way of thinking, I have to be careful just how far I go during this slack period, for fear I cannot make up when the harvest comes.

The cost of getting this information is considerable, and yet I could not feel satisfied to do business any other way. But I know that with the office force employed by some of the dealers in our city they cannot begin to get the information absolutely necessary to tell them where they stand. And again, it requires more than a bookkeeper to get the proper system started, and I believe that the Commercial Section of the N. E. L. A. is certainly doing the industry great good by making the dealer realize the importance of knowing "The Cost of Doing Business."

F. C. Green of the Oregon Association of Electrical Contractors and Dealers, asked for information on merchandising methods of California. He suggested employing an expert window dresser to put in the displays of a number of stores in the same city.

G. E. Arbogast, electrical contractor from Los Angeles, made the point that a good location is merely a trade opportunity. He also believes that the retail business must be supplemented by contracting work, stating that no one can profitably engage in an exclusively electrical retail business.

M. L. Scobey, electrical dealer from San Francisco, named advertising and location as the two essentials to the success of an electrical store. High rents in San Francisco, and low profits, will not permit an electrical store to exist in the shopping district. A comprehensive advertising campaign is also too expensive for any San Francisco dealer to carry on.

G. B. Furniss, Pacific Gas & Electric Company, advised the smaller dealer in outlying districts to conduct a house-to-house canvass in his neighborhood and thus gain the advantage of personal acquaintanceship.

H. W. Kimball of Oakland, in answer to a question by W. H. Gribble, stated that 23 per cent represented his overhead cost of doing a retail business. He agreed to furnish a detailed analysis of the items that make up his overhead.

W. L. Frost of the Southern California Edison Company welcomed the day when the appliance load will be built up by dealers instead of central stations. Brief remarks were made by H. N. Sessions of the Southern California Edison Co., and by Lee H. Newbert, in closing.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(Many of the big electric companies whose business is largely based on patents owned by them, have listed these at nominal figures in their balance sheets. In view of the provisions of the excess profits tax, however, which permits patents to be included in assets, this practice will probably be discontinued in favor of a valuation at approximate value. The elements which must enter into such a valuation are here considered for the convenience of those who deal in patents from any angle. The authors are prominent patent attorneys of San Francisco.—The Editor.)

THE COMMERCIAL VALUE OF PATENTS

The proper valuation of a patent is an intricate problem, but it often becomes necessary to fix such value with a fair degree of accuracy. In the past, some of our large patent owning corporations have adopted the policy of carrying their patent assets in their balance sheets at nominal values, but the War Excess Profits Tax Law, which permits patents to be included in assets, thereby reducing the amount of the tax, makes it advisable for all corporations to value their patents at their approximate value. The elements which enter into the solution of the problem of the value of the patent are many and some of them are to a great degree indeterminate. The past and present state of the particular act to which the invention relates, the time that the patent has to run, the probable demand for the invention, the possible future state of the art and the scope of the monopoly granted by the patent are all elements which enter into the problem.

Those corporations whose business is based upon patents and whose net earnings largely arise from such patents are usually protected by a group of patents, usually consisting of the basic patent and many patents on improvements made in the original invention, while the basic patent is still in effect. These improvement patents are such that a hold on the larger markets of the future is practically assured, and this is added to from time to time by the acquisition of other patents on new developments, so that patent protection can be built up and maintained independently of the life of any particular patent. At the expiration of the basic patent, the invention disclosed therein is open to the public, but usually the improvements which have been made and patented during the life of the basic patent, are such that even after its expiration, the corporation maintains a practical monopoly of the field.

To arrive at the value of a patent or a group of patents owned by a corporation or business, it has been assumed that the owner of the patent or patents will secure at least 50 per cent over the net earnings that would be possible if no monopoly existed, that is, one-third of the net earnings are due to patent protection. The value of the patent protection at any specified time would be the present worth of an annuity, on a 6 per cent basis, for the unexpired portion of the 17 year life of the patent, the annuity being one-third of the net earnings and fixed charges of the business. Patent protection exerts its controlling influence on all of the industrial arts and exacts tribute from all. The total amount of the tribute thus collected would be stupendous to contemplate. It might appear at first thought that this system of exacting tribute from the indus-

tries would hamper and retard them, but, as a matter of fact, the contrary is true and the effect has been to produce a great stimulus to industry by providing continual improvements, looking to both better product and lesser cost of manufacture.

Some corporations, as we have noted above, have carried their patents in their balance sheets at a nominal figure. Taking the figures from the balance sheets of 1916, we find the Ajax Rubber Co., the Goodyear Tire and Rubber Co., the Packard Motor Car Co., and the General Electric Company, valuing their patents at \$1.00 and the Victor Talking Machine Co., at \$2.00. It seems remarkable that the existence of the vast amount of value represented by the hundreds and possibly thousands of patents owned by these corporations should be concealed. Patents are property and property of such an important nature, that it should not be considered good business policy for any corporation possessing a large number of valuable patents to belittle or secrete them in the annual report. We feel, however, that the Excess Profits War Law will alter this situation tremendously.

Other corporations have endeavored to fix the value of their patents at their approximate value and the 1916 reports of the following corporations show substantial patent values:

American Cyanamid Company	\$ 3,543,475
Casein Co. of America	4,555,168
Diamond Match Company	2,000,000
Electric Storage Battery Company	11,000,000
Gillette Safety Razor Company	900,000
Langston Monotype Company	4,372,046
Mergenthaler Linotype Company	4,000,000
Waltham Watch Company	4,502,000
Ward Baking Company	6,000,000

Some corporations have included their patents, trade marks and good will in one item as follows:

United Drug Company	\$ 9,974,213
Advance-Rumely Company	14,172,305
American Pneumatic Service	7,243,597
General Railway Signal Company	3,000,000
Griffin Wheel Company	6,950,000
International Motors Company	6,153,266
Maxwell Motor Company	26,500,000
Studebaker Corporation	19,807,277
Underwood Typewriter Company	7,995,720
Submarine Boat Corporation	7,332,337
Worthington Pump & Machinery Company	7,567,073

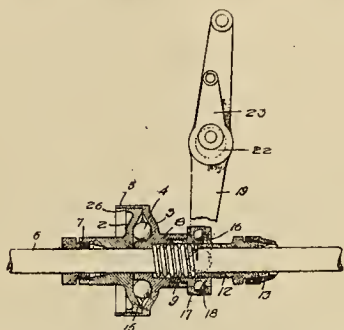
These lists include only a few of the large patent owning corporations taken at random. There are thousands of others, both small and large; some are large as given above, and others being small local manufacturing establishments, and the actual value of the patents owned by these companies is tremendous. The actual value of all patents now in existence cannot be calculated, because many of the late inventions, which in future years will have enormous value, at the present have little or no earning capacity. As an instance, there is one patent of which we have definite knowledge, which is now three years old and which as yet has earned nothing, but licenses which have recently

been signed bid fair to bring a return of \$500,000 this year; another patent will bring a return of \$10,000 this year with the prospect of this royalty increasing by leaps and bounds in each succeeding year.

NEW IDEAS FROM THE WEST

Speed Governor

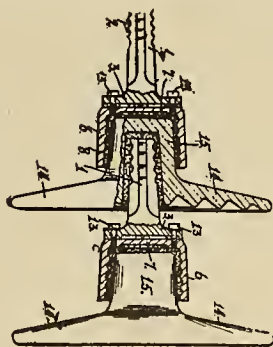
Patent No. 1,257,918, issued to Walter G. Noack of Stockton, Cal., and assigned to Tractor Motors Company of Benicia, Cal., shows a new form of governor which is particularly adapted to control the speed of internal combustion engines. The governor consists of two concave plates arranged in juxtaposition so that the height of the enclosed chamber de-



creases outwardly. Arranged in the chamber between the plates are a plurality of steel balls, which are thrown outwardly by centrifugal force as the plates are rotated, thereby causing a separation of the plates. One of the plates is fixed to a shaft and the other is slidable longitudinally along the shaft and is normally held in place by a spring. The amount of movement of the latter plate along the shaft is determined by the speed of the shaft and the plate is connected to the engine throttle, so that the throttle opening is closed when the speed becomes excessive. Governors of this type have a tendency to hunt and this tendency is overcome in the present governor by retarding the entrance and discharge of air from the chamber, thus producing a damping effect on the governor.

Insulator

Patent No. 1,257,516, issued to Earle A. Muckey of San Francisco, California, discloses a new form of insulator assemblage for electrical construction. This insulator as-

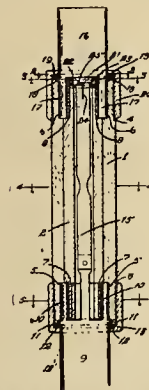


semblage consists of an insulator pin having a base flange to which the head of an insulator bell is bolted, the meeting faces of the large flange and the bell head being provided with interfitting tongues and grooves.

Refillable Fuse

Patent No. 1,257,418 shows a refillable fuse, which was invented by Basil L. Spurr and Frank A. Tittmore of Richmond, California. This fuse consists of a cylindrical insulating shell having a longitudinal socket formed in its wall and

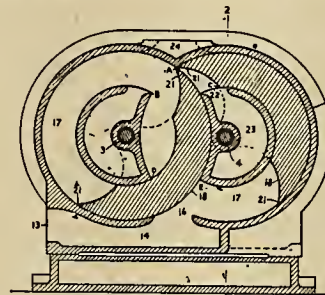
extending inwardly from the end of the shell. Arranged on the end of the shell is a removable contact member which is provided with an extension lying in said socket to prevent rotation of the contact member. Arranged on the other end of the shell is another contact member. Secured to the first con-



tact member is a fusible element which lies within the shell and which is electrically connected with the other contact member.

Rotary Pump or Compressor

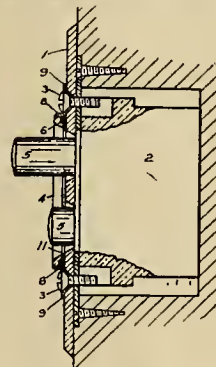
Patent No. 1,257,744, issued to Robert Schorr of San Francisco, Cal., shows a new form of rotary pump or compressor. This pump consists of a housing in which is arranged two hollow semi-cylindrical rotors arranged on parallel



spaced shafts and rotatable in opposite directions, one arranged to act as a valve for the other. Disposed concentrically with respect to each rotor are stationary semi-cylindrical outlet chambers, with the walls of which the rotors form running contacts. The liquid enters the housing from below, one of the pump chambers being always open, and is forced from the pump chambers by the rotors.

Attachment for Electric Switches

Patent No. 1,257,473, issued to Maxwell C. Frank of Piedmont, Cal., shows an attachment for electric switches which has fundamentally the same object in view as the constructions shown in former patents to this inventor recently re-



viewed in this column. The present invention relates to push button wall plates and embodies the use of a transparent plate having a coating of luminous material on its bottom face. The plate is held in place by a flexible frame which is backed by a yielding shim so that the plate is resiliently supported.

Lest we forget—

May 20-27—Red Cross Week



SPARKS—Current Facts, Figures and Fancy

(An improved insulating material is being made from fish refuse, valuable potash is being obtained from the residue dust of cement plants—in short, the utilization of waste products has become the keynote of the times. The shortage of metals and other essential materials is making itself more and more felt. Platinum is so rare that its use in any but war industries is being given up. In Germany they are experimenting on substitutes for gasoline. Nothing has yet been found, however, which will serve as a substitute for labor in the present shortage—except perhaps an electrically run machine.—The Editor.)

The old laborious method of cleaning the hulls of warships is being replaced by electricity. Formerly, it was customary to allow 170 to 200 man-days for the work, but several electrically driven machines have been found to do the work far more expeditiously.

* * *

According to the Scientific American, a new substitute for gasoline is being tried out in Germany. One part benzol and two parts alcohol are used, it is said, with good results. An ordinary carburetor may be used, and in a test a car ran 4.56 miles on one pint of the mixture.

* * *

A new Danish process by which certain by-products, valuable for electrical insulation, may be made out of fish offal, is soon to be put to practical test in Skagen, Denmark. The most important of the new products is called "cornimit," which, it is claimed, excels galalith as an electrical insulating material.

* * *

The motion picture film for advertising is being used not only by the individual firm but by trade organizations for international propaganda. A moving picture exhibition of British industries is now organizing a tour of Western Europe, North and South America, to illustrate the manufacture and use of British made goods.

* * *

The shortage of labor from which all industries are suffering is partly due to enlistment in the army and partly to the call of war industries. Including the 250,000 volunteer workers now being assembled, the United States will soon have 450,000 skilled men actually at work in shipyards. In 1916 the total number so employed was 44,962.

* * *

The periscope is now being used in the deadly wilds of the power plant. In order to read the temperature of the oil in transformers in a Western plant, it has been necessary in the past to use a step-ladder to reach the thermometer mounted at the top of each unit. By using a simple periscope on each transformer, it is now possible for the attendants to read the thermometer scale from the floor.

* * *

By way of utilizing one of the largest national resources of Norway, namely, the waterfalls and the electricity made therefrom, electric automobiles are now being discussed for all purposes. Heretofore gasoline cars have been practically the only ones in use in the country. For several months past no gasoline has been received, and as there are but few electric cars in Norway, automobiles have practically disap-

peared. There is a great demand now for American electric cars and storage batteries and other apparatus.

* * *

An electric precipitation process has enabled Western cement workers to obtain potash from the residue dust. In one case a year's trial under practical operation has resulted in the rather astonishing result of having a greater income from potash than from cement. Operating costs show conclusively that the process will be profitable at pre-war prices and that a supply of potash for fertilizer as well as ammunition, is now assured.

* * *

Flour is not so perishable a cargo for danger zone shipment as is generally believed. In a recent experiment, a sack was submerged in the ocean for 67 hours. It took a 98-pound weight to sink the 150-pound bag, in the first place, which would have supported 75 pounds on top of the water, it is estimated. When lifted the bag scaled 155 pounds. It was dried for four days and yielded 120 pounds of perfectly dry flour. Baked into bread, it gave perfect results.

* * *

Many of the delicate electric instruments essential to war machinery depend upon platinum for special parts. In this connection it is interesting to learn that Russia's supply of platinum is being entirely taken over by Germany. There are only between 25,000 to 50,000 ounces of the precious metal in the United States today, and Nevada, California, Utah and Oregon have turned out not more than 750 ounces a year, which geologists believe can be increased to 3000 ounces.

* * *

The subject of the use of electricity to increase crops has lately been brought to the fore by the London Times, which says that a method has been devised to overcome the difficulty of expense of electrification, as applied to both the growing crops and the seed before it is sown. Installations at which farmers can have their seeds treated by experts have been erected at several centers and are capable of treating some 30,000 sacks per month. The increase of yield from seed so treated, though not so great as the increase from electrification of the growing crops, is stated to be considerable, ranging from 25 per cent to as much as 80 per cent.

America's finest record—

May 20-27—Red Cross Week



PERSONALS

J. E. Woodbridge, of Ford, Bacon & Davis, consulting engineer for the Sierra & San Francisco Power Company, has

performed a distinct service to the West in the preparation of the recent engineering papers for the Del Monte convention of the Pacific Coast Section, N. E. L. A. Mr. Woodbridge, as chairman of the Engineering Section of this organization, laid especial stress on the necessity of studying methods of unusual economy in hydro-electric power production and steam electric generation. The beautiful and helpful papers that his committee presented

at the convention speak for themselves and will serve as a lasting memorial to his war service ideals.

G. J. Kuhrts, manager of the Pacific Electric Company of Los Angeles, was in San Francisco recently for a brief business conference.

H. B. Vanzwoll, general manager of the Sunbeam Division of the National Lamp Works of the General Electric Co., is visiting the Pacific Coast.

E. E. Arnold, sales manager electrical department H. W. Johns-Manville Company, attended the Del Monte convention and returned East via Salt Lake City.

J. A. Harnett has resigned as electrical engineer with the Western States Gas & Electric Company at Eureka, Cal., to join the Southern California Edison Company.

P. S. Klees, sales manager Franklin Electric Manufacturing Company, manufacturers of "Franklin" lamps, Hartford, Conn., is spending a few days on the Pacific Coast.

Carl H. Reeves, Seattle engineer, has been made a major in the U. S. Engineer Corps and put in charge of construction of a large cantonment being built just across the river from Washington.

Frank E. Getts, general manager of the Electrical Engineers Equipment Company of Chicago, Ill., and wife, are recent California visitors, and were interested attendants at the Del Monte conventions.

John F. Birney of Everett, former county engineer of Snohomish county, where he held that office for eight years, has been appointed assistant engineer of Whitman county, Wash., under J. M. McCaw, county engineer.

A. J. Myers, district manager of the Wagner Electric Manufacturing Company, with headquarters in San Francisco, has returned to his home city after an interesting six weeks visit at St. Louis and other Middle West points.

Samuel Demoss and **Albert Swartz**, both Seattle engineers, have been ordered to Waco, Texas, by the war department for special study in areology and meteorology in connection with the division of research in the signal corps.

Frank W. Harris, formerly locating and construction engineer of Seattle, is now in the service of the nation as captain of Company B, Forty-second engineers. He is at present located at Camp Humphreys, Virginia, where the regiment to which he is attached is being recruited for foreign service.

John J. Jackson, general attorney of the Westinghouse Electric & Manufacturing Company, with headquarters at Pittsburgh, and **Calvert Townley**, assistant to the president of the company, also a director of the Westinghouse Electrical Export Company, with headquarters in New York City, are Pacific Coast visitors.

F. H. Murphy, illuminating engineer of the Portland Railway, Light & Power Company, Portland, Ore., has been appointed by Samuel Gompers, chairman of the committee on labor of the Advisory Commission of the Council of National Defense, on the divisional committee on lighting. He has also been appointed local representative of the Illuminating Engineering Society.

J. L. Fugate of Salt Lake City has associated himself with the William A. Mullins Electric Company of Tacoma, occupying the position of sales and factory manager. Mr. Fugate was manager of the factory and fixture department of the Capitol Electric Company of Utah. This concern has 21 stores in Idaho, Utah and Montana, which were under his supervision.

James T. White has been appointed manager of the Oregon Gas & Electric Company, Medford, Ore., to succeed O. R. C. Grow, who left for Los Angeles to take the position of manager of the California Gas Company. Mr. White was formerly manager of the Oregon Gas & Electric Company at Roseburg, Ore., and was a former solicitor of the company at that office.

A. L. Anderson, electrical engineer, Federal Telegraph Company, Palo Alto, Cal.; **L. S. Blackman**, junior telephone and telegraph engineer, Interstate Commerce Commission, San Francisco, Cal.; **S. L. Chapin**, electrician and draftsman, Anaconda Copper Mining Company, Great Falls, Mont.; **B. D. Downing**, assistant engineer California Railroad Commission, San Francisco, Cal.; **V. D. Elliott**, electrical engineer, Southern California Edison Company, Los Angeles, Cal.; **S. M. Gardner**, electrical engineer Bay Point Electric Supply Company, Bay Point, Cal.; **C. E. Green**, president of the Green Engineering & Construction Company, Richfield, Utah; **W. C. Heston**, line engineer with the Portland Railway, Light & Power Company, Portland, Ore.; **Marc Holzer**, electrical expert aide, U. S. Naval Construction Office, Union Iron Works, San Francisco, Cal.; **R. S. Horth**, toll wire chief, Mountain States Telephone & Telegraph Company, Salt Lake City, Utah; **L. S. Hubbell**, switchboard engineer, Pacific Telephone & Telegraph Company, San Francisco, Cal.; **T. F. McCoy**, division construction engineer, Mountain States Telephone & Telegraph Company, Helena, Mont.; **C. F. Rose**, chief electrician, Nevada Consolidated Copper Company, Ruth, Nevada; **J. T. Thompson**, proprietor, Light Company, Portland, Ore.; and **R. A. Waite**, instructor in aerial observation, School of Military Aeronautics, University of California, have been elected associate members of the A. I. E. E.

R. M. Alvord, San Francisco manager of the supply department of the General Electric Company, as chairman of the

Commercial Section, helped most materially in sounding the keynote of the recent Del Monte conventions, which proved to be a protest against the closed meeting and a higher, more generous expression for mutual helpfulness among all branches of the industry. The commercial papers were so planned as to bring out this feature of expression and the splendid results of Friday afternoon's discussion fully demonstrated the far-sighted

ability of the Commercial Section chairman in preparing the papers for discussion.



To help lessen the agony—

May 20-27—Red Cross Week

W. S. Leffler, formerly assistant to the general agent of the Great Western Power Company, and secretary of the



Electric Sales Service Company of San Francisco, has just returned on a ten days furlough from the aviation training camp in Texas, where he has been since December. He has been commissioned Flying Lieutenant Reserve Military Aviator and qualified as Corps d'Arme Pilot. Mr. Leffler entered the service in December, and through his special preparation as an electrical man, was able in a short time to master not only the small observation machines, but soon became a

proficient operator of the largest and most modern type of fighting plane, and has been granted his lieutenant's commission.

G. R. Purvis of the Hurley Machine Company of Chicago was an interested visitor at the recent Del Monte convention.

H. L. Bleecker of North Yakima, Wash., vice-president of the Washington Water Power Company was a recent visitor in San Francisco.

H. R. Noack, having charge of Pacific States Electric insulator and hardware sales, San Francisco, spent a week in Seattle recently on business of the company.

A. J. Gladson, owner and proprietor of the Valley Electric Company, Yakima, Wash., has been spending a few days in Seattle on business.

Percy Booth of the Edison Appliance Company is making a permanent move to Chicago. In the loss of Mr. Booth, Southern California is losing one of its best known and most prominent citizens.

John A. Britton, with his wife and daughter, were in attendance at the N. E. L. A. convention. Mr. Britton's paper on "Public Policy," indeed marked perhaps the most important statement of the gathering.

Max Thelen, president of the California Railroad Commission, attended several of the sessions of the electrical conventions at Del Monte and spoke helpfully of the encouraging attitude of the commission toward public utility policies.

D. M. Folsom, Fuel Administrator for California, was unable to be present at the Pacific Coast Session N. E. L. A. convention of last week, but sent a most interesting letter on the present fuel shortage, which is reproduced elsewhere in this issue.

T. E. Bibbins, president of the Pacific States Electric Company, was the efficient director of the convention banquet at the Del Monte convention—one of the pleasant memories which will long remain with those fortunate enough to be present.

Samuel Kahn of the Western States Gas & Electric Company of Stockton, was chosen president of the Pacific Coast Section, N. E. L. A., at the recent convention. The well-known executive ability of Mr. Kahn augurs well for the association's coming year.

H. H. Schoolfield, of the Pacific Power & Light Company, Portland, Ore., represented that company at the Del Monte convention, in place of Mr. Merwin, who was unable to come. Mr. Schoolfield most helpfully reported on Northwest conditions at the Engineering session.

John R. Brownell, superintendent of safety, and Robert Eltringham, electrical engineer for the California Industrial Accident Commission, were in attendance at the Pacific Coast

Section, N. E. L. A., convention to represent the safety interests at convention discussions.

W. L. Goodwin of the General Electric Company, advocate of co-operation in the electrical industry, was one of the most forceful speakers at the recent Del Monte convention. Mr. Goodwin came all the way from New York City to bring his message of co-ordination to the California electrical men and his reception was a cordial one.

W. A. Brackenridge, president of the Southern California Edison Company, with his wife, was a brief visitor at last week's convention. Mrs. Brackenridge took a prominent and graceful part in the opening patriotic exercises when she led the singing of "America." Later, Mr. and Mrs. Brackenridge were called home, to the great regret of those present at the convention.

Mrs. H. F. Jackson, wife of Captain Jackson, president of the Sierra and San Francisco Power Company and president of the N. E. L. A. Pacific Coast Section, presided at the Women's War Service Session of the recent convention. Mrs. Jackson herself most forcefully introduced the subject of women's part in the present crisis, and the excellent program which followed was a tribute to her direction. This women's session was a distinct innovation in convention programs but was felt to have brought forward much that was worth while and to have developed into one of the most important of the convention meetings.

D. C. Jackson and Wm. B. Jackson, consulting engineers of Boston and Chicago for electric and allied properties, have both been commissioned as majors and are under orders to report for immediate service. Mr. D. C. Jackson is to go at once to France and Mr. Wm. B. Jackson presumably to be employed in army engineering service in this country. After the business now in hand has been completed by the other members of this firm, the office is to be closed for the duration of the war. Although made up of Eastern men, this firm have been consistently interested in Western affairs, one evidence being in their continuous patronage of the Journal of Electricity for the last fifteen years.

Paul M. Lincoln, consulting engineer, and past president of the American Institute of Electrical Engineers; John J. Gibson, manager of the supply department; Milton Henock, range specialist; M. C. Morrow, manager of the appliance division; and J. J. Jackson, attorney, all of the Westinghouse Electric & Manufacturing Company, from East Pittsburg, were among the Westinghouse delegates who attended the Pacific Coast Section of the N. E. L. A. convention at Del Monte last week.

OBITUARY

Harry Herbert Trowbridge, general counsel for the Southern California Edison Company and head of its legal department since 1903, died suddenly at his residence in Pasadena on March 21. Before going to Los Angeles Mr. Trowbridge was connected with the legal department of the New York Central & Hudson River Railroad. The successful career upon which he had entered in New York City had to be abandoned on account of ill health, but even greater distinction awaited him upon the Pacific Coast, where as the legal representative of the Southern California Edison Company, he soon became widely known as an authority upon corporation and public utility law.

Errata: On page 498 of this issue, the name of the author should be C. A. Andrus, instead of C. A. Andrews as given.

Just as you would sacrifice for
your child in pain—

May 20-27—Red Cross Week



MEETING NOTICES FOR ELECTRICAL MEN

(Co-operation has been the keynote of the past fortnightly period. An important meeting of the San Francisco Development League which was addressed by W. L. Goodwin, and a gathering of the Contractors and Dealers in Southern California to secure members both emphasized this idea. Conventions are planned for several of the national organizations in the early summer. The Del Monte convention of last week is reported elsewhere in these columns.—The Editor.)

San Francisco Electrical Development League

The one great meeting of the San Francisco Electrical Development League during recent months was that of May 1, 1918, which was held in honor of W. L. Goodwin, who has during recent months accomplished such effective work throughout the nation along lines of harmonizing the various fields of activity of manufacturer, jobber, contractor-dealer, and central station. The meeting was splendidly attended. Introduced by D. E. Harris, vice-president of the Pacific States Electric Company, Mr. Goodwin, in his characteristically forceful manner told of his work and explained how the symbolic representation of the well-known Wheatstone Bridge, depicted pictorially the ideal relations of the various branches of the industry.

Annual Meeting A. I. E. E.

Annual convention of the A. I. E. E. will be held in Atlantic City, June 26th to 28th inclusive. Headquarters will be at the Marlborough-Blenheim Hotel, but there are available in the near neighborhood many other good hotels which charge more or less for accommodations.

Present plans provide for a convention with four or five technical sessions, presenting from 12 to 16 papers; three delegates' meetings; a reception and dance, and ample opportunities for golf and other outdoor recreations. The entertainment features will not be elaborate but rather informal, the intention being to provide congenial association and recreation for those who attend.

The Synchronous Club

The Synchronous Club held their regular meeting at Walker Theatre Building, Los Angeles, on Thursday, May 2d, at 8:00 p. m., at which the subject, "Prime Mover Economics," was discussed by J. M. Lee, who is with the Bureau of Light and Power, City of Los Angeles. There is to be no mid-month meeting this month. Next meeting June 6, 1918.

Committee Appointments for Northwest Electric Light and Power Association

President Talbot of the Northwest Electric Light and Power Association has named the following to constitute the Public Policy Committee for Oregon:

Chairman, J. L. White, district manager, Oregon Power Company, Albany, Oregon.

George G. Bowen, sales manager, Northwestern Electric Company, Portland, Oregon.

A. B. Bower, manager, Condon Electric Company, Condon.

E. A. Boyd, manager, Vale Electric Company, Vale.

R. M. Boykin, engineer, North Coast Power Company, Portland.

C. J. Edwards, president, Coast Power Company, Tillamook.

T. H. Foley, manager, Bend Water, Light & Power Company, Bend.

H. V. Gates, president, Heppner Light & Water Company, Portland.

F. A. Harmon, manager, Eastern Oregon Light & Power Company, Baker.

Geo. L. Myers, Pacific Power & Light Company, Portland.

E. G. Robinson, president, Molalla Electric Co., Canby.

C. M. Shinn, vice-president and manager, Cottage Grove Electric Company, Cottage Grove.

J. T. Thompson, manager, Sheridan Light & Power Company, Sheridan.

R. M. Townsend, Portland Railway, Light & Power Co., Portland.

H. L. Walther, general superintendent, California-Oregon Power Company, Medford.

This committee is concerned with all matters having to do with relations between the public utilities and the public. The committee is composed of a representative from each of the Class A members (member companies) of the Association. It held its first meeting in the offices of Pacific Power & Light Company, April 3d.

At the convention of the Association in September it was decided to create a committee composed of representatives of jobbers, manufacturers, etc., electrical contractors, dealers, and the central station industry, to further co-operation. The convention authorized the president to name one representative from the association to be a member of this committee, and F. H. Murphy, illuminating engineer of Port-

land Railway, Light & Power Company, Portland, Oregon, has been named.

Contractors and Dealers Association

In order to secure as many new members as possible, the contractors and dealers held an open meeting in Garfield Hall, Los Angeles, Friday evening, April 12th, and all contractors and dealers in Southern California were invited. G. E. Arbogast, president of the Southern California Electrical Contractors and Dealers, presided, and talks on contractors' problems and on the work of the association were made by J. C. Rindler, manager, Southern California Electric Company, Los Angeles; H. B. Woodill, Woodill-Hulse Electric Company, Los Angeles; Paul D. Howse, Electrical Products Corporation, Los Angeles; B. R. Hensel, electrical contractor, Los Angeles; and A. L. Spring, representative California Electrical Co-operative Campaign. At this meeting 11 new members to the association were secured and during the past three weeks the membership in Southern California has increased over 40 per cent.

BUILDERS OF THE WEST—XXIX



JOHN B. MILLER

The food control, the aviation, the naval consulting board and the Red Cross have been vastly assisted in the present national crisis by calling upon the master minds who have had an eminent part in developing the great natural resources of the West. To John B. Miller, chairman of the board of directors of the Southern California Edison Company—a company of world-beating attainment in engineering and in efficiency—this issue of the Journal of Electricity is dedicated, not only for his eminent service to his company, but also for the wonderfully helpful work he is doing in charge of all Red Cross work west of the Mississippi River.



ANNIVERSARY BANQUET OF THE SACRAMENTO ENGINEERS' CLUB

A recent gathering of the prominent engineers of Sacramento which celebrated the first anniversary of the founding of the Engineers' Club of that city.

Contractors and Dealers in Attendance at Open Meeting Held in Garfield Hall, Los Angeles, Friday Evening, April 12, 1918.

G. E. Arbogast, vice-president and general manager, F. E. Newbery Electric Company, Los Angeles.
 R. E. Amann, manager Amann Electric Works, Los Angeles.
 H. C. Barnes, Los Angeles.
 Chas. Bean, Lordsburg.
 J. P. Boring, Orange.
 C. H. Bush, Los Angeles.
 Wm. J. Burk, Los Angeles.
 George Bullock, Los Angeles.
 W. C. Cook, manager Gardena Electric Company, Gardena.
 H. J. Cook, partner, Gardena Electric Company, Gardena.
 R. E. Carter, purchasing agent, Beacon Light Company, Los Angeles.
 C. H. Clausen, manager Dana Electric Company, Los Angeles.
 G. B. Capps, partner, Sierra Electric Company, Los Angeles.
 O. J. Crow, Los Angeles.
 W. O. Driskell, Los Angeles.
 R. H. Evans, Los Angeles.
 Paul Ehms, partner, Golden State Electric Co., Los Angeles.
 G. Gans, partner, Gans Bros., Los Angeles.
 L. Gans, partner, Gans Bros., Los Angeles.
 C. F. Green, manager Green's Electric Store, San Pedro.
 G. D. Gillingham, Los Angeles.
 A. W. Gonnerman, Los Angeles.
 A. P. Gaylord, Pasadena.
 A. Hilleary, Los Angeles.
 L. C. Hooker, Los Angeles.
 P. D. Howse, president Electrical Products Corporation, Los Angeles.
 B. R. Hensel, Los Angeles.
 S. F. Jones, partner, Winder & Jones, Covina.
 W. L. Le Sage, estimator, Beacon Light Co., Los Angeles.
 H. Lees, partner, West End Electric Co., Los Angeles.
 L. H. Lang, Los Angeles.
 G. Loveberg, Los Angeles.
 J. H. Lowe, Los Angeles.
 J. W. Lane, manager Lane Electric Co., Long Beach.
 F. O. Lantz, manager Lantz Electric Co., Long Beach.
 F. McGinley, manager Harbor Electric Co., Wilmington.
 J. A. Newton, manager J. A. Newton Electric Co., Glendale.
 J. J. Prevost, manager Pico Electric Shop, Los Angeles.
 H. Rothwell, Los Angeles.
 F. H. Roberts, Los Angeles.
 J. C. Rendler, manager Southern California Electric Co., Los Angeles.
 C. A. Renard, president Renard & Stary, Los Angeles.
 H. G. Stone, Hollywood.
 V. M. Stedman, manager Stedman-Manson Electric Co., Whittier.
 F. D. Stevenson, Los Angeles.
 A. S. Tyler, Los Angeles.
 H. L. Vonder Kühlen, Los Angeles.
 J. E. Wilson, manager Wilson's Electric Shop, Los Angeles.
 R. B. Winder, partner, Winder & Jones, Covina.
 Chas. Walsworth, manager San Pedro Electric Co., San Pedro.
 A. B. C. Dyer, Coast Electric & Machine Co., Santa Monica.
 H. B. Woodill, president and general manager Woodill-Hulse Electric Co., Los Angeles.
 C. Wurdeman, manager Coast Electric & Machine Co., Venice.
 A. L. Spring, representative California Electrical Co-operative Campaign.

Oregon Society of Engineers

The dangers, causes and results of forest fires, and the value of prevention and carefulness were aptly illustrated and explained by A. G. Jackson, of the educational department of the Forestry Service, in a stereopticon lecture given before the Oregon Society of Engineers at the Central Library, at their regular meeting on April 24th.

District No. 6, with headquarters in Portland, of which George H. Cecil is in charge, is the largest forestry division in the United States. There are 43,000,000 acres of timber lands under his supervision. This total comprises one-sixth of the whole amount of standing timber in the United States.

Mr. Jackson also emphasized the fact that the national

forests were for the use of the people, both for recreation and business purposes. Summer residences may be built in attractive places therein at a very low cost.

Previous to Mr. Jackson's talk the society adopted a resolution to the effect that their salaries should be substantially increased.

"Win the War for Permanent Peace" Convention

A convention of the League to Enforce Peace, of which Wm. H. Taft is president, is to be held in Philadelphia on May 16th and 17th. Stephen S. Wise, Anna Howard Shaw, Charles B. Elliot, Charles Evans Hughes, and Henry Van Dyke are to be among the speakers.

The objects of the convention, as stated, are: To sustain the determination of our people to fight until Prussian militarism has been defeated; to confirm opposition to a premature peace; to focus attention on the only advantage the American people hope to gain from the war—a permanent peace guaranteed by a league of nations.

War Convention, N. E. L. A.

The thirty-fourth annual meeting of the National Electric Light Association and its forty-first convention, to be held at the Hotel Traymore, Atlantic City, June 13th and 14th, 1918, will be devoted entirely to problems of the war.

This will be a strictly business meeting, without entertainment of any kind. It will concern itself entirely with the vital problems of the industry arising out of the war, toward the winning of which the thoughts and energies of every public utility must be consecrated.

No papers will be read. Reports from committees and individuals, and discussions will be confined to matters of major importance, and the brief two days will allow no time for the usual helpful discussions on general topics relating to the progress of the art. Everything said and done must be keyed to a victorious conclusion, and an early one, of the great struggle on which our nation has entered and in which our industry is taking a part of continually growing importance.

Foreign Trade Club

At the May 8th meeting of the Foreign Trade Club of San Francisco, H. C. de Groot, a recent arrival from Makassar, Holland East Indies, spoke on the subject, "American Trade with Celebes Isles." J. W. Gjerlov, a recent arrival from the West Coast of South America, spoke on "American Trade with the West Coast of South America. Melville S. Topf, of McDonald & Co., a recent arrival from the Orient, gave an interesting talk on "Business Conditions in Japan, Korea, Manchuria, China."

The only regret we can have is
that we are unable to help
more—

May 20-27—Red Cross Week



WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.
May 7th—E. R. Shepard—"The Bureau of Standards and Electrolysis Mitigation."

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.
April 20th—Joint meeting with Denver Section, A. I. E. E.

San Francisco Section

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
April 16th—S. C. Lindsay—"Recent Additions to the Generating Equipment of the Puget Sound Traction, Light & Power Co."

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
April 19th—J. W. Hungate, C. F. Uhden, P. S. Daniels—"Hydraulic Turbines."

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock, Assembly Room of Commercial Club, Salt Lake.
April 19th—E. R. Shepard—"The Bureau of Standards and Its Work."

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.
April 20th—Joint meeting with University of Colorado Branch, A. I. E. E.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Executive Committee—at-Large—W. D. Kohlwey, California; Executive Committee—S. C. Jaggard, Portland.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.
Convention—Del Monte, May 8-11.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Saturday, 12:15; The States. Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggard-Sroufe Co., Portland.
Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Next Meeting: Del Monte, May 6-11.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

Nevada Section, N. E. L. A.

Chairman—Geo. A. Campbell, Reno, Nev.
Next Meeting—April 13th.

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next Meeting—Del Monte, May 9-11, 1918.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—H. C. Morris.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League
President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m.
All meetings called off until May 15th, to help sale of Liberty Bonds.

San Francisco Electrical Development League
President—R. E. Fisher
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 50 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—C. A. Blair, Los Angeles.
April 18th—Annual Synchronizing and Banquet.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers

President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.
San Francisco Section, A. S. M. E.
President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.
President—B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.
April 9th—First anniversary dinner and celebration.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section
Secretary—Norman C. Thorne.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
April 17th—"What I Have Learned at Foreign Trade Meetings"—by the members.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

New Business

The M. J. Walsh Electric Co., of Portland, Ore., are now engaged in installing the electrical construction for the McEachern Ship Yards at Astoria, Oregon.

The port of Astoria, Ore., recently awarded a contract to the Ewart Electric Company for the installation of the electric wiring and material for the new bulk grain storage bins and work house now nearing completion on the port property. Its bid was in the sum of \$9588. Other bids received for the work were as follows: Astoria Electric Co., \$10,598.74; National Electric Co., of Portland, \$10,560; Knight & Co., \$10,077; S. C. Jaggard Electric Co., \$13,840.

During the year just ended the Western States Gas & Electric Company, Stockton, Cal., division, reports a total of 928 kilowatts of new business added to its lines as a result of the electric heating and cooking campaign. This includes 94 ranges, 82 water heaters and 83 air heaters. The gas output of the company continues to show increases of approximately 40 per cent over a year ago, largely due to the consumption of the Holt Manufacturing Company, which is ranging from 8,000,000 to 10,000,000 cubic feet per month.

The International Vegetable Oil Company of Richmond, Cal., contemplates construction of a new factory in Richmond and will use 300 horsepower in electric motors for the operation of the plant.

The Acme Electric Company, 95 Virginia street, Seattle, has been awarded contract to wire the garage building being erected at Fourth avenue and Lenora street, which the Great Northern Construction Company is building. The company has completed installation of nine motors and several arc lights at

915 First avenue for the Bernhard Engraving Company, now consolidated with the Art Engraving Company at the same address.

The Arrow Electric Company, Seattle, has secured the contract for overhauling the electrical equipment in the four-story Howard D. Thomas building at 2000 Fifth avenue, which is to be occupied by the Saxony Knitting Company.

The NePage-McKenny Company report securing the contract for installing the electric construction in the new municipal grain elevator from the Grant Smith Co.

Changes and Beginnings

The business of the National Electric Utilities Company, New York City, has been purchased by Landers, Frary & Clark of New Britain, Conn., who will increase and develop the business.

J. C. English Company are fitting up a new and up-to-date fixture and electrical appliance store on Fifth street, Portland, between Morrison and Alder streets.

J. O. Story of Tacoma has bought an interest in the big Thorsen-Hendricksen mill at Toledo, Ore., and the name of the company has been changed to Yaquina Bay Railroad & Lumber Company, with Mr. Story as vice-president and general manager.

The electric power plant at Toledo, Ore., formerly owned by the Thorsen-Hendricksen company, will change its name also, and hereafter will be known as the Lincoln County Light & Power Company. This plant, which supplies Toledo and Newport with light and power, will at once be enlarged by the addition of a 2000 horsepower turbine and dynamo. This additional power will be used to operate a big band saw mill

which the company is building here, and to furnish power for a shipyard.

The Sprague Electric Works of the General Electric Co. announces the removal of its Boston office from Devonshire street to 84 State street, Boston, Mass. The St. Louis office has been removed from the Chemical Building to the Pierce Building, St. Louis, Mo.

The Electric Store, owned by the Comet Electric Company of Eugene, Ore., and the electric store of Cottage Grove have been consolidated. The two stores will be maintained, with the headquarters in Eugene. P. L. Womeldurf, heretofore sole owner of the Comet Electric Company, will have charge of the two stores and the city business in Eugene and Cottage Grove, while A. S. Myers, of the Cottage Grove store, will have charge of the farm lighting and telephone end of the business.

The Comet Electric Company has the contract for the wiring in connection with the addition to and alterations in the court house, and has already commenced work on the job.

Reorganization of Northern Electric Company

Another step toward the consummation of the reorganization of the Northern Electric Railway Company was taken recently when the reorganization committee filed with the Railroad Commission an application for approval of an amended plan which, it is stated, has been approved by a majority of the company's creditors. The application states that more than 94 per cent of the bondholders of most of the companies involved and approximately 97 per cent of unsecured creditors have approved the plan, while 89.50 per cent of Chico Electric Railways and 81.60 per cent of Northern Electric Railway bondholders have also given their consent to the new arrangement.

The application goes on to say that a new corporation will be created to take over all of the properties of the Northern Electric Company, the Northern Electric Railway Company (Marysville and Colusa branch), and the Sacramento and Woodland Railroad Company. This will be done by foreclosure of the various bond mortgages and by the committee purchasing the properties at the foreclosure sale and turning the same over to a new corporation.

The new corporation will not assume any of the indebtedness of the present companies. The proposed new corporation shall have a capital stock of 52,000 shares of the par value of \$100 each, or \$5,200,000, divided into 19,022 shares of first preferred (\$1,902,200), 9578 second preferred (\$957,800), and 23,400 common (\$2,840,000).

San Luis Obispo Celebrates Complete Installation of New Street Lighting System

What was generally conceded to have been the biggest and best meeting to date held by the San Luis Obispo Chamber of Commerce took place at San Luis Obispo, April 4, 1918, when the organization celebrated the complete installation of a new street lighting system, brought about through the activities of a Chamber of Commerce committee. The meeting took the form of a dinner, to which the people of the county were invited as the guests of the Chamber. People were present from the principal towns of San Luis Obispo county, and the feeling of harmony between the county seat and the county at large was most noticeable.

Radio Operators Scarce

The great demand by the Navy and the Army has drained the commercial field of trained radio operators. Soon shipping companies may find themselves unable to comply with Government rules and regulations. As a consequence of the scarcity of operators the enormous demand for trained men has led to many offers of large salaries. The vessels being built by the Emergency Fleet Corporation for the U. S. Shipping Board, the Dutch vessels taken over by the Government, and the interned German vessels will all be equipped with wireless. A man experienced in radio telegraphy will almost be able to dictate his own terms of compensation.

U. S. Radio Inspector B. H. Linden and the University of California Extension Division have co-operated in forming an evening class in radio telegraphy. The class will train men who desire to enter the commercial field as radio operators or to aid their country in its crisis. For full particulars communicate with the University of California Extension Division, 301 California Hall, University of California, Berkeley, or with the branch office, 330 Lick Building, 62 Post street, San Francisco. Telephone numbers: Berkeley 7100 and Kearny 100, respectively.

City Regulation of Public Utilities

A constitutional amendment recently proposed to be submitted to the people of Oregon by the initiative is the outgrowth of the six-cent fare case in Portland, and provides for placing in the hands of incorporated cities for a period of 25 years all governmental powers relative to the regulation of public utilities.

Sabotage Act and the Public Utility

The act of congress entitled "An act to punish the willful injury or destruction of war material, or of war premises or utilities used in connection with war material, and for other purposes" (popularly known as the sabotage bill), approved April 20, 1918, is the most important and sweeping of all war statutes relating to hostile or anti-war activities.

This practically means any part of the transportation system or transportation facilities of the United States. It also includes public utilities, which supply war industry plants, such as the water, light, telephone and telegraph service to war industry plants or to forts, camps and other military and naval stations.

First Trial of Great Turbine

Electrification of the Coast section of the Chicago, Milwaukee & St. Paul Railway took a long step forward recently when its big turbine generator, the largest in the world, was turned over for the first time. The contract for current was let to the Puget Sound Traction, Light & Power Company, and the generator was installed in the White River or Lake Tapps plant, near Deringer. Installation of this turbine generator furnishes power for the operation of the electrified line of the Milwaukee from Othello to Tacoma.

The railway has yet to install substations and string trolley lines over the division. The trolley poles are now being placed in position, though operation electrically will be delayed for some time yet because of a shortage in much of the equipment required and the inability of manufacturers to keep pace with the orders with which they have been flooded since war was declared.

Increases in Utility Rates

That public service commissions everywhere are beginning to realize that public utilities must have larger rates of return if they are to remain in business, is brought out clearly in a pamphlet just issued by the National City Company. The pamphlet contains a list of the increases granted during 1917 by local and state commissions in the United States and Canada.

Attention is called to the fact that out of 462 applications for increased utility rates reported in 1917, increases were granted in 401 cases, or more than 86 per cent of the total. This means, the company says, that local and state commissions have become convinced that utilities in general are entitled to larger rates of return in order to afford adequate public service.

To Prevent Fuel Shortage

United States Fuel Administrator Harry A. Garfield has issued the following statement:

Every householder, every public utility, and every industrial user of coal engaged in work essential to the prosecution of the war are earnestly advised and urged to place with-

out delay their orders for coal to cover their needs for the 12 months beginning April 1st.

Suit to Enjoin State Railroad Board

The legal status of corporations purchasing power from other companies and distributing it to the consumer will be established by a suit filed in the Federal District Court by the Napa Valley Electric Company against the State Railroad Commission.

The action seeks to perpetually enjoin the Commission from interfering with the contract rates for electricity as established between the Napa Valley Electric Company and the Calistoga Electric Company. The Railroad Commission has rendered an opinion holding that it has jurisdiction to fix rates lower than those set forth in the contract between the two companies.

The main contention of the action through which the Napa company seeks to bar the Railroad Commission from altering the present contract rates is that the Calistoga Electric Company is not a consumer within the meaning of the Public Utilities act, buying the electricity from the Napa company and reselling it to residents of Calistoga and vicinity in Napa county.

Street Car Men to Get More Pay

An increase of three cents an hour is to be added to the wages of employees by the Puget Sound International Railway & Power Company of Everett, Wash. This means a raise of 25 cents a day. The Everett street car systems, the Everett-Snohomish and the Everett-Seattle interurban are to be operated under a contract between the men and the company for a period of one year.

Stenographers and Typewriters Wanted

The United States government is in urgent need of thousands of typewriter operators and stenographers and typewriters, both men and women. All who pass examinations for the departments and offices at Washington are assured of certification for appointment. It is the manifest duty of citizens with this special knowledge to use it at this time where it will be of most value to the government. Women especially are urged to undertake this office work. Those who have not the required training are encouraged to undergo instruction at once. Examinations for the departmental service, for both men and women, are held every Tuesday, in 450 of the principal cities of the United States, and applications may be filed with the Commission at Washington, D. C., at any time.

The entrance salary ranges from \$1000 to \$1200 per year. Advancement of capable employees to higher salaries is reasonably rapid. Applicants must have reached their eighteenth birthday on the date of the examination.

Public Hearing on Safety Rules for Gold Dredges

The Industrial Accident Commission of California called a public hearing for Tuesday, May 7, 1918, at 10 o'clock a. m., in room 323, 525 Market street, San Francisco. The object of this hearing was to consider amended tentative safety rules for gold dredges, which have been prepared by the following committee:

Harold Mestre (chairman), consulting engineer; F. L. Lowell (secretary), deputy mine inspector, Industrial Accident Commission; L. D. Hopfield, department manager Natomas Company of California; C. W. Gardner, representing Hammon Engineering Company; A. L. Wilde, district representative International Brotherhood of Steam Shovel and Dredge Men; Carl Brown, manager California Casualty Indemnity Exchange; R. L. Eltringham, electrical engineer, Industrial Accident Commission; H. M. Wolfen, mining engineer U. S. Bureau of Mines, chief mine inspector Industrial Accident Commission.

In preparing these tentative rules the committee proposed a number of safety requirements which are applicable to gold dredges only. They have revised certain sections of

the general safety orders and the electrical utilization safety orders, so that the same will be more applicable to gold dredges.

LANE'S MESSAGE TO INDUSTRY

In an address to the men who control American industry, delivered before the Americanization Conference in Washington, Franklin K. Lane stated the serious condition that our country faces, due to our unassimilated foreign population. He said in part:

"Now there are several things which we have come upon recently which seem to those of us who have not been wise to be discoveries. The first is that we have a great body of our own people, five and a half millions, who cannot read or write the language of this country. The second is that we are drafting into our army men who cannot understand the orders that are given them to read. The third is that our man power is deficient because our education is deficient. The fourth is that we ourselves have failed to see America through the eyes of those who have come to us. We have failed to realize why it was that they came here and what they sought. We have failed to understand their definition of liberty."

Fortunately the remedy is in the hands of the patriotic leaders of industry. It is up to them to develop a spirit of loyalty to America among their foreign-born employees, and the employers can do it very effectively.

Instruction in the duties of citizenship should go hand in hand with the teaching of English. The advantages of becoming naturalized should be brought home to the alien, and he should be encouraged to take out first papers and should be taught the legal forms for securing final papers.

Patriotism to the land of his adoption can be stimulated among foreign employees. Noon-day talks in the factories, patriotic posters, liberty bond and thrift stamp campaigns will develop loyalty if the employers persist in Americanization work and are not satisfied with a brief and spasmodic effort.

Patriotic literature and speeches in the native language of the immigrant will secure the attention of those who have not yet learned English.

But all the patriotic utterances will be wasted effort unless at the same time the spirit of fair play is observed in our dealings with the alien employee. Instead of discriminating against him, he should be regarded as a guest of the nation and an asset to our man-power.

Here is one reason for Americanization: the knowledge of English reduces the danger of accidents:

"I should be afraid to estimate the aggregate amount of waste each year to this country through a non-English speaking operative's failing to understand an order, with a resultant costly blunder. I have known a single blunder to cost as much as \$2000. Then there are thousands paid out for injuries, many of which may be traced directly to the inability of the employee to understand English."

(Reported by the Efficiency Engineer of the Semet-Solvay Company of Detroit.)

Other reasons for Americanization are the promotion of loyalty to the company and to the nation.

The reduction of labor turnover through such Americanizing influences as improved housing, better working conditions and fair handling of labor disputes is recognized as good business.

The resolutions adopted by the Americanization Conference follow:

1. The adoption of the policy that the Federal Government should co-operate with states and through the states with the local communities in carrying on an extensive, intensive and immediate program of Americanization through education, especially for non-English speaking foreign-born adults.

2. That the industries employing large numbers of non-English speaking foreign-born persons should co-operate with local communities, state, and Federal governments in carrying out this proposition.

3. That adequate appropriations should be provided by the Congress to be expended through appropriate government agencies for the foregoing purpose.

4. That in all schools where elementary subjects are taught they should be taught in the English language only.

LATEST IN EVERYTHING ELECTRICAL

(Many petty trouble calls in central station service departments might be eliminated if a convenient instrument for testing circuits were on hand. Such a device is here described for the use of inspectors, line men, trouble men and others. An automobile electric kitchen designed for army use, with provision for all emergencies, promises a new field of opportunity for electric ware. Other devices and appliances which have recently been put on the market are further noted.—The Editor.)

A FUSE AND CIRCUIT TESTER

A fuse and circuit tester designed for the testing of all alternating or direct current circuits from 110 to 600 volts has recently been gotten out by the Electric Service Auto Company of Portland, Ore. It is used for locating open or short circuits, grounds, blown fuses or any other trouble occurring in lighting or power lines or apparatus.



Tube tester

It was designed to do away with the more cumbersome, costly and dangerous "lamp bank" and replace it with an economical and safe device that can at all times be carried in the pocket. Its safety features are particularly emphasized. It is always set for testing 600 volts, and is safe even if the push button be accidentally pressed.

The case is made of molded insulation with no current carrying parts exposed. The complete tester weighs 8 ounces and the overall dimensions are 3 inches long, 2 inches wide, 1 inch deep. It is provided with 6 inch flexible leads equipped with brass tips.

The tester is not only very handy for the electrician's or "trouble shooter's" kit, but is universally useful wherever electricity is used.

P & S MEDIUM BASE, BRASS COVERED RECEPTACLE

To satisfy the demand for a medium base, brass covered receptacle, Pass & Seymour are releasing P & S 60020. The shell or cover of this receptacle is in one piece and is made especially rigid by an additional bead which is spun on the skirt of the cover. The shell proper of this device is threaded to receive the standard types of the "Uno" shadeholder.



P & S Receptacle

The brass shell or cover is anchored to the porcelain interior by means of twin screws and these in

turn are held in place by means of special washers.

The porcelain foundation for the interior is cast in one piece and on this the keyless interior is mounted—providing a freedom of accessibility and wiring room, so much desired by the practical wireman.

The supporting screw-holes for this device are spaced $1\frac{5}{8}$ inches and 2 inches on center. The holes for introducing the wires from the back of this receptacle are of ample size to accommodate heavy wires and the terminal screws will be found of sufficient size and strength to grip and hold the wires. The lamp-screw shell is of special copper alloy and is secured to the porcelain base by a heavy horseshoe reinforcement.

THE TRIUMPH ELECTRIC SEWING MACHINE

The compact, portable electric sewing machine has proven so popular that it will, eventually largely supersede the foot-operated type in districts where electricity is available.

A new portable machine has just been placed on the market by the Triumph Specialty Company, 235 Canal street, New York City. This machine consists of a sewing machine head, a motor, a speed regulator and a cover. The whole outfit can be packed inside the cover, and is so light that it can

be easily carried, and so compact that it can be put away in a closet. The machine, which can be used on any table, is always ready for operation when connected to any lamp socket.

The sewing machine head is manufactured especially for the Triumph Company by the New Home Sewing Machine Company, and is an adaptation of one of the most popular



A popular sewing machine

models. It operates on the lock-stitch principle, and is provided with a full set of attachments for tucking, ruching, and other operations.

Power is supplied by a Westinghouse Sew-Motor, which can be operated on direct current circuits of 115 volts, and on alternating current circuits of 110 volts, of any frequency up to 70 cycles. The motor drives the machine through a belt, and not by means of a friction pulley, thus assuring quiet operation and avoiding undue side thrust, which wears out the bearings. Occasional filling of the grease cups (oil is not used), is the only attention the motor requires.

The speed regulator which rests on the floor and which is operated by pressure of the foot, provides any speed from one to several hundred stitches per minute. It is so constructed that there is no sparking at the contacts, and, being made of steel and heavily insulated, it is practically indestructible. A ten-foot, well-insulated and reinforced flexible cable, with an attachment plug, is provided for connecting the motor with the lamp socket.

The machine is handsomely finished in polished nickel and black enamel and is mounted on a Circassian walnut base with rubber feet to prevent marring the furniture on which it is placed. The cover is also of Circassian walnut.

AN AUTOMOBILE ELECTRIC KITCHEN

A new automobile electric kitchen has been designed and built by the Duparquet, Huot & Moneuse Company, primarily for army use. It consists of a standard Ford touring car and Smith Form-A-Truck attachment on which are mounted a small direct-current generator and a number of insulated cooking compartments. The cooking compartments are fitted with electric heating units and provided with passages for the exhaust gases from the engine, the heat which materially assists in the cooking operations.

The vehicle body is 10 feet long and 4 feet wide, and is fitted with a canvas top of the regulation army type, with sides extending to protect the operator from the weather. Eighteen-inch hinged side platforms are fitted which, when in position, provide access to all cooking compartments, and when closed lie within the clearance line of the vehicle.

The generator is of standard General Electric construction, totally enclosed, and is rated at $6\frac{1}{2}$ kw., 125 volts, 1800 r. p. m., and is designed for continuous operation at rated load. The generator is driven from the transmission shaft of the automobile by silent chain. Voltage is judged by pilot lamp and regulated by the speed engine, no instruments being necessary. Protection against short circuit and overload is provided by an overload circuit breaker and fuses. A larger, and for many purposes more desirable, equipment employing a 12 kw. generator, could be mounted on a two-ton truck.

Water for cooling the engine is contained in a heavy galvanized steel tank, located in an insulated compartment at the rear of the vehicle. The water is circulated through



Automobile Electric Kitchen

the engine and radiator by means of a centrifugal pump mounted on the engine. This cooling water may be used for culinary purposes, if the pipes, radiator, etc., are occasionally flushed out and cleaned.

All methods of cooking, with the exception of broiling, have been provided for. Broiling can be done by installing an electric broiler in the top of the oven.

Underneath the oven, and heated by it, is a warming closet large enough to hold roasting pans. This closet is fitted with drop doors on both sides for serving purposes. Under the warming closet are located the switches, circuit breaker and all fuses for heating circuits.

There are four fireless cooker compartments, each having a capacity of 30 gallons. The insulation, which is two inches thick, is fireproof, self-supporting and light in weight.

Because of the efficient insulation of all cooking compartments it is necessary to operate the generator at its full capacity for only a short time. In ordinary cooking operations the fuel consumption will, of course, depend upon the extent to which the operator takes advantage of the fireless cookers. Cooking can be done as long as the engine runs. In case of complete break-down current can be supplied from the generator of a second car, if this is available, and the exhaust heat from this car used to continue the cooking operations, thus keeping both kitchens in service. The second car could also tow the disabled one, if necessary.

The electric generator could also be used to supply light

or power for any purpose within its capacity. For instance, the $6\frac{1}{2}$ kw. generator could supply current for 246 25-watt lamps or 650 10-watt lamps, or power for the electrical equipment of a field hospital for X-Ray work, sterilizing, etc.

While performing this service the exhaust heat could be employed for cooking and heating the water. The generator on the larger equipment, of course, could furnish correspondingly more power.

BELL RINGING TRANSFORMER

An improved bell-ringing transformer is announced by



Bell ringing transformer closed

The Packard Electric Company of Warren, Ohio. The new instrument is of the same electrical construction as the former Packard Belle Transformer, but several improvements have been made in the design of the case. The former type had a brass-bolted two-piece case with lugs projecting from the top and two lower sides, and these have been eliminated by making the heavy porcelain case in one piece. This results in a neater, more

compact instrument—the only projecting parts being the bell-wire binding posts and two small slotted flanges on the base to receive the screws by which the instrument is secured in place.

The electrical element is inserted in the case through an opening in the base and then completely covered with a fine grade of sealing compound, thus forming the unit into practically one solid piece. The leads are marked in raised letters on the adjacent porcelain, thus insuring against any possible mistake in making connections.

The new instrument is so made that a dead short circuit on the secondary or bell side for an indefinite length of time will pull less than 15 watts from the 110 volt service wires.

The cases are finished in blue with a high glaze which renders the unit attractive to the eye and assists materially in making sales.

NORTHWESTERN ACTIVITIES

Traction Company Wage Offer Rejected

The offer of the Puget Sound Traction, Light & Power Company to increase wages of trainmen, which increase should be binding until August 1, 1919, or until 60 days after the conclusion of peace in the European war, was rejected by Tacoma and Seattle employees. The proposed agreement provided for increase of pay for trainmen of 5 cents an hour and for \$15 a month extra for other crafts paid monthly, the agreement dating from April 15, 1918. It was claimed by those opposing the offer that it would tie them to an agreement for an indefinite period, and it was claimed that the advance would be insufficient, particularly in view of the scarcity of men. The agreement under which the men are now working expires July 31, 1918.

Plans for Elevated Road Changed

Plans for the elevated street railway line which the city of Seattle proposes to build into the industrial section at a cost of \$350,000, are to be changed to admit of greater clearance for railroad tracks over which the line crosses. The height of the clearance is to be 23 instead of 22 feet, and the width of the clearance 9 feet instead of 7 feet 6 inches.

BOOKS AND BULLETINS

Patent Office Fees on "Enemy" Owned Patents

The War Trade Board has authorized the payment of United States Patent Office fees requisite for the filing, prosecution, registration and preservation of patents, trademarks, prints, labels, or copyrights, of an "enemy" or "ally of enemy" by any person within the United States, where such person is the holder of a power of attorney granted by such "enemy" or "ally of enemy," provided however, that when such fees are to be paid from the funds of an "enemy" or "ally of enemy," in the United States, such payment shall be made subject to the approval of the Alien Property Custodian.

Textile Mill Lighting

"Modern Methods in Textile Mills," by Eugene Szepese, is a very attractive little book of 54 pages published by the Westinghouse Lamp Company. It is a very clever and "modern method in advertising," for the booklet emphasizes the important part that artificial light plays in up-to-date textile plants.

The Hunt Tension Adjusting Coupling, for use with stevedore rope, is being introduced by an illustrated letter sent to the trade.

Upbuilding the Industry

A pamphlet dealing with problems of rate regulation and labor, the relationship between public utilities, the communities they serve, and their employees, has been reprinted from an address, before the Detroit Board of Commerce, by Theodore P. Shonts, under the title, "The Old Order Changeth, Giving Place to New."

A collection of letters from various state utility commissions and inspection bureaus, recommending the observation of the National Electrical Safety Code to the electrical contractors, lighting companies and architects of their respective states, has been sent out by the National Bureau of Standards in connection with the announcement of the revised edition.

A press bulletin of the Chamber of Commerce of the United States contains the recommendations of the Committee on Water Power Development as to what legislation Congress might wisely pass for encouraging the development and conservation of the water power resources of the United States.

A supplemental list of inspected mechanical appliances has been recently given out by the Underwriters' Laboratories of the National Board of Fire Underwriters.

A reprint from a New York paper which is being sent out presents the arguments of O. B. Willcox for better financial support of public utilities under the heading, "To Keep Utilities from Railroads' Fate."

"Electrical Equipment in the Woodworking Industry" is the title of a new circular just issued by the Westinghouse Electric & Manufacturing Company. The publication is profusely illustrated by views of motor driven woodworking machinery both alone and as installed in representative woodworking plants. Starting with the general subject of motor drive, the reasons for its adoption, such as increased production, better light, greater safety to employees, higher efficiency of machines, more accurate knowledge of cost and greater freedom in power distribution, are explained.

Electric Appliances and Supplies

An attractive colored folder which points out ways in which you may "help your customers save fuel, food, time, labor, and keep business coming your way," by concentrating on the sale of electrical appliances, is the recent trade stimu-

lant which has been issued by the Hotpoint Division of the Edison Electric Appliance Company.

A dealers' catalogue of electric fans for 1918 has been gotten out in attractive shape by the General Electric Company.

The Cutler-Hammer Mfg. Co., of Milwaukee, Wis., has just issued publication No. 220, four-page pamphlet illustrating and describing C-H Electric Beer Vat Driers. Further, it gives some of the advantages of drying beer vats by electricity. The C-H Beer Vat Driers are made with two and three heats, and in three sizes, ranging from 750 to 1250 watts on low heats and 3000 to 5000 watts on high heats. The pamphlet also illustrates a direct current motor starter, a porcelain push socket and a porcelain push switch especially adapted for use in breweries and other damp places.

A price list of porcelain Shurlock key and keyless sockets and receptacles has been gotten out by Pass & Seymour Company.

A new publication has been issued by the Bureau of Standards (Circular 67) entitled, "Combined Table of Sizes in the Principal Wire Gages." This table combines in one series the sizes in the American (B. & S.), Steel, Birmingham, (Stubbs'), British Standard, and Metric Wire Gages, arranged in order of diameters of wires. It gives the diameters of all the gage numbers in these five systems, in mils, inches, and millimeters, also the cross-sections in square mils, circular mils, square inches, and square millimeters. The table is specially useful to manufacturers who wish to determine the nearest equivalent in American or British gage sizes of wires, specified in millimeters or square millimeters, or vice versa.

Byers' wrought iron pipe is the subject of an attractive folder gotten out by the A. M. Byers Company of Pittsburgh, Pa.

A bulletin on Drum-type Switches as well as one on Automatic Starters for direct current motors have been recently given out by the General Electric Company.

Of Scientific Interest

Bulletin No. 99 of the University of Illinois Engineering Experiment Station covers the subject of "The Collapse of Short, Thin Tubes," setting forth the results of a series of experiments carried out by A. P. Carman, professor of physics at that university.

"Apparent Dielectric Strength of Varnished Cambrie" is the title of Bulletin No. 15 of the Research Division, Electrical Engineering Department, Massachusetts Institute of Technology. The paper represents a series of investigations by A. E. Kennelly and R. J. Wiseman, reprinted from an article appearing in the *Electrical World*.

Powdered Coal as a Fuel

by C. F. Herington, mechanical engineer; size 6x9 in.; 211 pages; published by D. Van Nostrand Company, New York, and for sale by the Technical Book Shop, San Francisco. Price \$3.00.

The present importance of the fuel situation gives particular interest to this comprehensive treatise on pulverized coal. The question of which coals are adaptable for powdering, and their preparation, is here discussed, as well as the application of this fuel in various industries. The book is well illustrated, showing the various types of apparatus in use both in preparing and consuming the coal, with the principles involved and actual installation. The final chapter is devoted to explosions, and it is particularly pointed out that powdered coal is as safe as coal in lumps, provided common sense and judgment are exercised. A bibliography of both magazine articles and books on the subject is appended.

NEW ELECTRICAL DEVELOPMENTS

(Several new power developments are proposed in the Northwest. Tacoma, which has just voted down several bond issues is soon to be faced with another to meet the car situation. In the Pacific Central and the Southwest districts, much interest is being taken in the possibility of hydro-electric developments under the new Federal finance bill. A large project is suggested for the Feather River district. Several applications for water for power development are recorded.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—G. Geske, at \$16,186.50, was awarded the contract for labor, materials, etc., for the elevated municipal railway.

SALEM, ORE.—The Public Service Commission recently denied an application from the electric light and power company of Burns for an increase in rates.

SEATTLE, WASH.—The Auto Electric Hand Signal Co. of Seattle, has been incorporated for \$25,000 by J. C. Myer, H. A. Wilson and W. F. Rotermund.

SEATTLE, WASH.—The Leone Dual Lighting & Irrigation Company has been incorporated for \$50,000 by C. P. Gorman, J. G. Brown and W. H. Angel.

SPOKANE, WASH. — Negotiations will soon be under way for a new general street lighting contract. It is proposed to replace the present arc-lamp lighting system with nitrogen-filled lamps.

CHEHALIS, WASH.—The ordinance to grant O. E. Anderson and others of Portland a franchise for a second electric light and power system in the city of Chehalis was lost in a recent election by 26 votes.

ASTORIA, ORE.—The Port of Astoria has awarded a contract to Ewart Electric Company for the installation of electric wiring and material for the new bulk grain storage bins and work house, at \$9588.

SEATTLE, WASH.—The Rothert Process Steel Company is contemplating an addition to its smelter (100 ft.) and the installation of a 10-ton electric furnace. The offices of the company are located at 622 Harriman street, Seattle.

RAVELSTOKE, B. C.—Plans are being made by the Larnark Mines Company for the early expenditure of \$25,000 to \$30,000 in building a power plant and installing equipment. The manager of the company is W. B. Dornberg of Spokane.

SEATTLE, WASH.—The Board of Public Works has decided to purchase 514 tons of 60-pound rails for the municipal elevated railway and has closed a contract with the Industrial Machinery Company, Smith Building, at \$68 a ton, including angle bars.

NEW WESTMINSTER, B. C.—The Campbell River Lumber Company has recently installed a step-down transformer station to convert the high-tension current of 12,000 to 2200 volts. The amount of energy used in the mill is about 950 horsepower.

YAKIMA, WASH.—Application has been filed with the Federal land office here by the Blackrock Power & Irrigation Company for an easement for a transmission line for a distance of about 35 miles from Priest Rapids to Hanford. The line is to carry 66,000 volts, the term asked is 50 years, and the rental \$5 per mile.

ASTORIA, ORE.—In order to provide suitable transportation facilities for the industrial plants in Astoria, the Port of Astoria Commission has authorized the immediate construction of the first section of a proposed belt line railroad to encircle the water front from Tongue Point around Smith's Point to Fairfield Point on Young's Bay.

ASTORIA, ORE.—The Hammond Lumber Company has signed a contract for another turbine and generator of 2000 horsepower capacity and capable of furnishing 3000 horsepower for several hours at a time. In addition to this, four 600 horsepower water tube boilers have been purchased. This will quadruple the capacity of the Pacific Power & Light Company here.

SALEM, ORE.—The application of the Crown Willamette Paper Company for a permit to appropriate 200 second feet of water from Young's River near Astoria for development of 2273 horsepower has been approved by State Engineer Lewis. It is estimated that the development will cost \$150,000 and involves the construction of a dam 80 feet in height, short pipe line and power house.

TACOMA, WASH. — The city council has designated Charles D. Atkins and City Attorney U. E. Harmon to provide means for raising money to purchase more cars for the municipal street car line to the tide flats. It is presumed that they will recommend that bonds be issued in the sum of \$300,000 on the new system to refund the present bonds and provide money for buying additional cars.

BELLINGHAM, WASH.—The stock and equipment of the Mills & Larson electric store at 1331 Dock street has been purchased by the Modern Electric Company, 1322 Dock street. Both stores will be operated at present, but later the retail store will be removed to the location formerly occupied by Mills & Larson and the store at 1322 Dock street will be converted into a battery station and electric repair shop. The contracting business of Mills & Larson will be continued.

WALLA WALLA, WASH.—The city commissioners have ordered a survey of Mill Creek above the water intake as far as Tiger Canyon. The purpose is to supply the city with a better quality of water during the winter and early spring, and to determine whether there is sufficient power to operate a hydro-electric plant capable of pumping water from deep wells, which would assure the city a wholesome supply of water at all seasons. If sufficient power can be generated, the commissioners will investigate the question of lighting the city streets.

SPOKANE, WASH.—The construction of the proposed Niagara system power plant here with a rated capacity of 40,000 horsepower will be necessary in two years if the business of the Washington Water Power Company continues to grow in that period as it has in the last year, according to the testimony of D. L. Huntington, president of the company, given before the joint public service commissions of Washington and Idaho at Spokane recently. The hearing is being held to establish a basis for re-valuation of the property of the company.

TOLEDO, ORE.—J. O. Story of Tacoma has bought an interest in the Thorsen-Hendricksen mill here, and the name of the company has been changed to Yaquina Bay Railroad and Lumber Company. The electric power plant here, formerly owned by the Thorsen-Hendricksen Company, will change its name to the Lincoln Light & Power Company. This plant, which supplies Toledo and Newport with light and power, will at once be enlarged by the addition of a 2000 horsepower turbine and dynamo. This additional power will be used to operate a big band saw mill.

GOLD HILL, ORE.—The United States District Court for this district has confirmed the sale of the Rogue River Public Service Corporation's properties in Jackson and Josephine counties to Newton W. Roundtree, of Portland, for a sum just sufficient to cover the court charges and subject to the bonded indebtedness. The holdings consist of a large acreage in the two counties and the power plant at Grants Pass and Gold Hill, with power lines and franchises with the two cities. The bondholders, aggregating the sum of over \$500,000, forced the concern into the hands of receivers last June and the local creditors' claims, amounting to over \$40,000, are a total loss.

SEATTLE, WASH.—The Skykomish Power Company has submitted modified plans for the improvement of the Stillaguamish power site. Estimates covering the proposed additional developments are as follows: A dam to be constructed at an elevation of 950 feet with an ultimate elevation of 1050 feet. With the development of the Stillaguamish alone, this site would produce 66,000 horsepower with power house at an elevation of 400 feet, or 90,000 horsepower with dam at 1050 feet; the building of two penstocks from standpipe to turbine 600 feet in length and 8 feet in diameter; the installation of two vertical units giving 30,000 horsepower in power house; power house of reinforced concrete for future extension to provide two more units of same capacity, etc. All these features, including water rights, to cost \$5,500,000.

PACIFIC CENTRAL DISTRICT

SONORA, CAL.—Mining operations are to be resumed at once on the Gold Ridge mines. Electric power is to be installed.

SAN FRANCISCO, CAL.—The Beach Electric Company has issued \$10,000 worth of shares to Harry Beach, Theo. De Pass and Ahram P. Burr.

VALLEJO, CAL.—Sealed bids are being received by the city council for lighting streets and furnishing electric current for lighting and power purposes for the year.

RED BLUFF, CAL.—According to City Engineer Rollison, construction on the municipal lighting system for this city will be ordered shortly. The system planned will cost about \$6000.

SAN FRANCISCO, CAL.—The Chicago and San Francisco Amusement Company has let a contract for an electric sign on marquee of theater building at 1077 Market street, to cost \$1500.

RUTH, CAL.—Fred W. Gundlach has applied for one second foot of waters of Mad River in Trinity county for use on 20 acres. Applicant proposes to pump the water and the estimated cost of the diversion is \$2500.

FRESNO, CAL.—Engineer Clarence Murray has been instructed to prepare plans and specifications for the electrolyser system on South Van Ness avenue and calling for alternate bids on cast iron and concrete standards.

AUBURN, CAL.—A telephone exchange has been established in Penobscot by the Pacific Telephone & Telegraph Co. The exchange is in the residence of J. L. Zuver, a former telephone man, and he is the operator and manager.

SAN FRANCISCO, CAL.—The Delta Electric Company of Marion, Indiana, manufacturers of electric lighting devices and specialties, have opened a branch at 686 Mission street, this city, in charge of O. E. Yates, Western sales manager.

RED BLUFF, CAL.—The city trustees of Redding are now ready to go ahead with the installation of a unit of municipal lighting system, which has been estimated to cost about \$6000. The city is now paying \$335 per month for operation.

LITCHFIELD, CAL.—Alton B. Curtis of Litchfield has applied for one second foot of Balls Canyon Creek, tributary to Willow Creek, in Lassen county, for the irrigation of 65 acres by means of a pumping plant lifting the water to a height of 70 feet.

RICHMOND, CAL.—The city council has voted \$12,000 for electrical equipment for the municipal wharf, now under construction. Contracts have been awarded for two electric trucks, at a cost of \$4383, to the United Vehicle Company, and for a five-ton electric crane to the Cyclops Iron Company at \$7500.

VALLEJO, CAL.—The following bid was received by the chief of the bureau of yards and docks, Navy Department, Washington, D. C., for furnishing the Mare Island Navy Yard two 500 kilowatt rotary converters with switchboard and accessories: Westinghouse Electric & Manufacturing Company, Washington, D. C.: Item 1, \$24,203; 1a, \$1000; 2, \$19,121; 2a, \$850; 3, \$5277; 3a, \$150.

JACKSON, CAL.—The Gage mine, situated on the Jones property near Shawmut, has given promise, in the shape of a good body of ore, that it will develop into a big gold producer. W. F. King, manager of the Sierra & San Francisco Power Company, was called to the mine to make necessary arrangements for operating by electricity.

OAKLAND, CAL.—Officials of the San Francisco-Oakland Terminal Railways are going to have a little railroad of their own. Articles of incorporation have been filed with the county clerk for the Emergency Transportation Company, a \$20,000 corporation in which W. R. Alberger, George H. Harris, F. W. Frost, B. W. Fernald and W. T. Smith have one share each.

OCEANSIDE, CAL.—At a meeting of the improvement society, the telephone and lighting proposition came up for discussion. Authority was given to Mr. Pugh to go ahead with the construction of the telephone system as soon as possible. A petition for a lighting system will be presented to the board of supervisors, after which the residents will vote upon the question.

WOODLAND, CAL.—In order to furnish the Yolo county rice growers with water for this season's crop, contracts were let by President Huston of the Yolo Water & Power Co. as follows: Pump contract awarded to Byron Jackson Company, 55 New Montgomery street, San Francisco, and engines to California Hydraulic Company, 70 Fremont street, San Francisco. Installation must be made by June 15th.

OAKDALE, CAL.—The irrigation board has appointed Directors Richards and Crow to see about getting a right of way for a road to the D. S. Reed ranch in Langworth. The board also agreed to build a 300 foot pipe line from the Dry Creek lateral to the old Palmer ranch. The board ordered the superintendent to investigate the cost of a pipe line or ditch to Wesley Reid's ranch, and other land in that section, a total of 200 acres.

SAN FRANCISCO, CAL.—The proposal to build a combination street and steam railroad over the recently built Hunter's Point boulevard, to accommodate the 3000 men who will be employed at the shipbuilding plant to be constructed there, was the subject of a discussion at a conference of members of the Board of Supervisors, representatives of the Federal government and officials of the Union Iron Works. A tour of inspection of the proposed route was made.

MODESTO, CAL.—L. Wiley, expert reclamation engineer of Boise, Idaho, one of the two engineers recommended by the U. S. Reclamation Service for the work, has been employed jointly by the Modesto and Turlock irrigation districts to make the necessary investigation to determine the practicability of the Don Pedro Reservoir site on the Tuolumne River above the La Grange dam for storage purposes, and will enter upon the work soon after May 15th.

GAZELLE, CAL.—Edward C. Latchem of Gazelle has applied for 12 second feet of Grouse Creek, tributary to East Fork of Scott River in Siskiyou county, for the generation of electrical power for the operation of mining properties. The principal works consist of a dam 20 feet high, 75 feet long on top and 50 feet on the bottom, and a main ditch two and one-half miles in length. The total fall to be utilized is 400 feet, and it is proposed to generate 400 theoretical horsepower. The same applicant asks permission to use the water also for mining purposes.

OROVILLE, CAL.—Plans for another huge hydro-electric plant for the Feather River district have been announced by a group of Oroville men, and will be presented to the commission which will be appointed to administer the huge fund Congress has appropriated to finance industries considered essential to the conduct of the war. The plan calls for the conversion of the Bald Rock Canyon into a huge impounding reservoir. This can be accomplished by constructing a dam 1160 feet in length and 650 feet in height. With this dam a total fall of 1750 feet can be secured, capable of developing 166,000 horsepower. The plans of the backers of the project

for this development are to be made in three units. The first power plant will be located at the foot of the dam. A second power plant is planned for Canyon Creek, while a third power plant would be situated near Bidwell Bar. It has been estimated that the total project can be constructed for not more than \$7,500,000.

SAN FRANCISCO, CAL.—Colusa Land and Water Company of San Francisco has applied for 200 cubic feet per second of the waters of the Sacramento river in Colusa county for agricultural purposes. The works consist of the following: Main canal, 8.7 miles long; a pumping plant at the point of diversion consisting of one 42-inch pump with capacity of 100 second feet, driven by 400 horsepower motor, and two 26-inch pumps with capacity of 50 second feet each, driven by 200 horsepower motors; a duplicate of the foregoing plant to be installed at the end of the main canal. It is proposed to irrigate 8822 acres and the estimated cost of the project is given as \$219,890.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—The Pacific Electric Railway Company has been instructed by the board of public utilities to double-track its car line between Wilmington and Long Beach immediately.

NOGALES, ARIZ.—The Mountain States Telephone & Telegraph Company is beginning to prepare for the installation of its new system in Nogales. It will be two or three months before all will be complete.

SAN DIEGO, CAL.—The San Diego Electric Railroad Co. will start work at once on rebuilding one mile of track at East San Diego and pave the same distance. The balance of the present track on the East San Diego line will be repaired.

BURBANK, CAL.—The city clerk is advertising for bids for a substation which will receive energy from a three-phase, 50 cycle, 15,000 volt transmission line. The transformers are to be indoor type, 200 kva. each, core type, single-phase, oil cooled.

LA HABRA, CAL.—At a meeting of the Merchants and Manufacturers Association, a contract was signed by 20 members of this body with the Edison Company for goose-neck electric street lights at a cost of \$3 for 100-watt lights and \$1.75 for 60-watt lights.

LOS ANGELES, CAL.—An order was adopted by the city council for the installation of necessary ornamental lighting posts and appliances upon Broadway between California street and First street, and upon Broadway between First street and Tenth street.

LOS ANGELES, CAL.—Permission has been granted the board of public service commissioners to use certain tide lands at the Los Angeles harbor for the operation of a substation in connection with the generation or distribution of electrical energy by the bureau of power and light.

EL CENTRO, CAL.—Bids have been taken by the directors of the Imperial Irrigation District at El Centro for the construction of a check gate in the West Side main canal to be known as "Foxtail Checkgate." The structure will be located about four and one-half miles north of Dixieland.

OXNARD, CAL.—Construction work of office building, pump house and superintendent's residence at Ivy Lawn cemetery has been started, and the Edison Company is erecting poles to carry a power and electric light line to the cemetery in order to furnish the power for the pumping machine and to light building and grounds.

LOS ANGELES, CAL.—The promised fight against the Economic Gas Company's effort to secure a blanket franchise from the county failed to materialize when the franchise was put up for sale by the board of supervisors. The company's bid of \$100 was accepted. The board also granted the Midway Gas Company a blanket franchise. The bid was \$100.

YUMA, ARIZ.—The matter of letting a franchise for electric power, light and water for the valley in the region of

Semerton and Gadsde was considered at a meeting of the board of supervisors. The Yuma Gas, Water & Light Company asked for an extension of its franchise, which as yet it has failed to exercise. Messrs. Ewing and Sanguinetti asked for an exclusive franchise.

YUMA, ARIZ.—The Coachella Ice & Electric Company, which supplies the Yuma Gas, Light & Power Company with current from the high Sierras of California, has started the work of putting in a large new transformer for local needs at the California end of the Highway bridge. The new apparatus will be complete in every detail and will enlarge the capacity of the local distributing system by 50 per cent.

WILCOX, ARIZ.—A telephone company has been formed here with 24 charter members, and a telephone line is to be built in the near future connecting the Stronghold with both Cochise and Pearce. The main line will be about 20 miles in length, with several miles of side lines. At the meeting of the telephone company the following officers were elected for the ensuing year: President, C. H. Wilson; vice-president, A. J. Havin; secretary, R. L. Meers; treasurer, G. H. Dean.

ROSWELL, N. M.—Indications are that the waters of the Ruidoso, which have not only supplied farmers of Rio Ruidoso and Hondo valleys for a number of years, but have also been made one of the beauty spots of New Mexico, are to be diverted over the mountains to Carriozo and used by the El Paso and Southwestern Railway Company. The plan is to run a pipe line from the north fork of the Ruidoso across the mountains to Carriozo, and then north along the line of the El Paso and Southwestern. The Ruidoso Water Users' Association has made a protest, asking a suspension of this order and for a hearing before the commissioner of public lands.

LOS ANGELES, CAL.—Wilbur O. Lusk of Los Angeles has applied to the Water Commission for 250 cubic feet per second of the Pit River, Hatchet Creek and Montgomery Creek in Shasta county, for the development of electrical energy at a drop near Round Mountain. There is a proposed ditch and pipe line six and one-half miles long, and the amount proposed to be developed is 7500 kw. The same applicant also makes application for the use of the identical water for irrigation purposes after its use for power generation, by means of a ditch and pipe line 30 miles in length. The amount of land proposed to be watered is 40,000 acres. The cost of the combined project is estimated at \$250,000.

THE INTER-MOUNTAIN DISTRICT

SALT LAKE, UTAH—The Diebold Electric Company has recently been incorporated in this city.

VERNAL, UTAH—The Vernal Milling & Light Company has filed an amendment to its articles of incorporation, increasing the capital stock from \$100,000 to \$150,000.

GOLDFIELD, NEV.—If present plans mature, Caliente will have electric lights in a short time. The Salt Lake Route has agreed to furnish electricity to Lincoln county for \$200 a month.

BUTTE, MONT.—The Butte Electric Railway Company will spend about \$70,000 in track and street improvements within the next few weeks, including new switches, double tracks, etc.

SALT LAKE, UTAH—The Woodruff Irrigation Company of Salt Lake City has filed an amendment to its articles, increasing the number of stock shares from 4000 to 10,000, and bringing the capital stock up to \$50,000.

PRICE, UTAH—The Wellsville City Irrigation Company has been incorporated at Price for \$4140, by Daniel H. Maughan, Wm. Allen, Geo. Haslam, Robert A. Leishman, H. C. Parker, H. L. Maughan and Frank O. Gunnell.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company has recently completed an extension of its transmission lines to the Outland Ranch, and has accepted a contract to extend its lines to other ranches in that vicinity.

Ad-itorial Comment

(Advertising is the salesman's best ally. It smooths his way and conserves his time. It is the advance agent that is continually building prestige for the house he represents and the goods he sells. It is worse than foolish to imagine that a territory is covered, especially this great territory west of the Rockies, because a salesman goes over it once a year or even every three months. The salesman may get the business that is to be had when he is on the ground, but how about the intervening time or the little places he misses? The advertisement goes before to introduce him, is there to back him up when he is there, and is on the job after he leaves. It works for him all the time and is a needed supplement to his work.—The Aditor.)

Sprague Electric Works calls attention to SS cable for wiring purposes.

Crouse-Hinds Company shows a unique and compact motor-starting switch housed in a conduit.

Federal Sign System (Electric) announces that the fuel administration has revoked the lightless night order.

L. Plaut & Company advertise the Four-In-One Light for use in salesrooms, offices, banks and residences.

Garland-Affolter Engineering Company advertise Pacific Coast stocks of Peerless fans and Howell motors.

J. H. Parker, Inc., typifies the high quality of Parker insulator products by a Muller type strain insulator.

The Electric Storage Battery Company has a type of "Exide" battery available for any battery power requirement.

American Electrical Heater Company details 20 features which distinguish the "American Beauty" electric iron.

Baker-Joslyn Company states that Duraduct, the original single wall flexible non-metallic conduit, is good because it's singular.

Jeffery-Dewitt Company gives seven reasons why Jeffery-Dewitt suspension type insulators should be used on high tension lines.

National Carbon Company shows that Three Pyramid brushes give an additional factor of safety in the operation of commutating machines.

The Youngstown Sheet & Tube Company urges the use of Realflex armored cable wherever flexibility and durability are essential in wiring work.

The American Conduit Mfg. Company points out the possibilities of increased wiring business made possible by Wiremold, the new metal raceway.

Landers, Frary & Clark emphasizes the timeliness of June sales of Universal electric home needs to housekeepers in general and brides in particular.

Allis-Chalmers Mfg. Company exemplifies its centrifugal pump service by a picture of a 300 cu. ft. per second pump built for the city of Memphis.

National Metal Molding Company show a picture of the University Hospital, University of California, in connection with the permanency of Sheraduct.

Freydberg Bros., Inc., a new advertiser in these columns, lays emphasis upon the adaptability of "Fastej" tape for winding armatures and field coils.

Wagner Electric Manufacturing Company states in connection with Wagner Quality motors, that the "greatest single factor in production is power dependability."

Manhattan Electrical Supply Co., Inc., advertise dry batteries which give the right kind of service.

Edison Storage Battery Supply Company shows an electric truck which has been in continuous service for eight years.

The Cutler-Hammer Mfg. Company shows four types of starters for various kinds of a. c. motors.

Pacific Electric Mfg. Company illustrates and describes a simple and effective disconnecting fuse set.

Economy Fuse & Mfg. Co. emphasize the fact that the "Drop Out" renewal link feature of their fuse has been a great business builder.

Hubbard & Company lists and pictures hot-dipped galvanized pole line hardware and Peirce construction specialties available for overhead line construction.

Detroit Insulated Wire Company attributes large Coast sales to adequate and convenient stocks as well as to the high quality of Detroit rubber covered wire.

The Hughes Division of the Edison Electric Appliance Company points out the value of the electric range load to the central station under daylight saving.

American Vulcanized Fibre Company recommends Vul-Cot Fibre as a superior product from which to make insulating cleats and other insulating parts.

Hurley Machine Company presents the Thor washing machines as a dependable product for good dealers to link up with—a money-making combination.

Condit Electrical Mfg. Company features its Type E-4 oil switches and circuit breakers for service between 200 and 500 amperes and for voltages from 4500 to 7500.

The Locke Insulator Manufacturing Company is now represented on the Pacific Coast by the Pacific States Electric Company as exclusive sales agents for Victor Insulators.

Century Electric Company employs a motor driven dough mixer to exemplify the desirability of the Century motor's heavy starting torque and keep-a-running ability.

Westinghouse Electric & Mfg. Company tells of its pioneer work with the steam turbine, whose introduction and development has marked a turning point in power house practice. It also cites the equipment of Boston cars with Westinghouse unit-switch control units and motors.

General Electric Company outlines the strong advertising campaign whereby it is aiding the dealer to sell G. E. fans. Nine distinguishing features of G. E. safety switches are given. Type R I motors are featured as the simplest, quickest and best way for meeting rush demands for small power equipment. A strong argument is also given for standard unit panels in switchboard construction.

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In This Issue: New Advances in Industrial Lighting

JOURNAL OF ELECTRICITY

VOL. 40 No. 11

SAN FRANCISCO, JUNE 1, 1918

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Wagner Polyphase Motors Wagner Single-Phase Motors

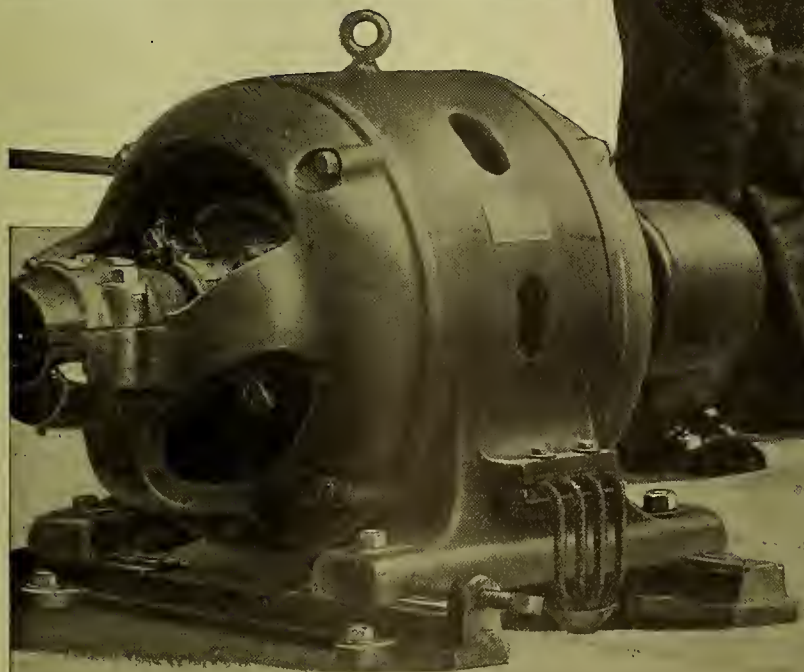
start and stop with a single switch.

Wagner BA Single-phase Motors and BW Polyphase Motors are particularly suited to remote or automatic control or where uninformed or unskilled labor must handle them.

Send for Bulletin 11014 and 11114.



Wagner Electric
Manufacturing Company, St. Louis, Mo.



P & S Canopy-Rosettes

Compact devices that will supplant the canopy, and its companion ceiling switch.

The Porcelain Base of these devices will fit on both the 3¼-in. and 4-in. Outlet Boxes and needs no insulating ring, crowfoot or insulating joint. This device is especially recommended for metal ceilings or concrete walls.

The terminals are ½-in. from the surface wired over, and are especially arranged for Loop Wiring, where the ability to loop the line-wires over the terminals without break or splice means neatness, safety and saving of time.

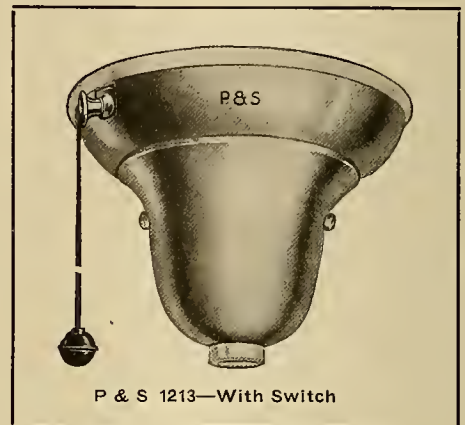
A SPECIAL CORD GRIP, located immediately above the cord terminals, relieves the strain on the terminals.

The cord is attached to the terminal, carried up and over the cord grip—a time-saver.

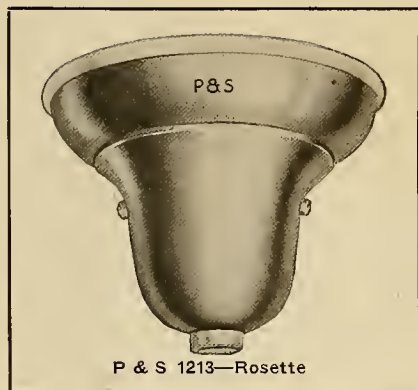
The strength and capacity of P & S 1211 and 1213 are more than sufficient to support and control any Mogul Base Lamp, or the larger Industrial and Commercial Units.

RATING: 5A.—250V. 10A.—125V.

The 10-ft. linen cord allows the Unit to be located far out from a balcony or high above the plane of illumination.



P & S 1213—With Switch



P & S 1213—Rosette

THE BRASS CANOPY SNAPS ON OR OFF INSTANTLY WITHOUT THE USE OF TOOLS. It is fastened to the base by Phosphor Bronze Spring Lugs, on opposite sides of the Canopy.

Press the thumb and finger on the buttons—separate the Canopy from the base—the terminals are accessible for wiring and the Canopy may be instantly replaced where it is held rigidly in position.

Trade No.	Schedule	Carton	Std. Pkg.	Pkg. Wt.Lbs.	List Price
1211 With ¾-in. Female Nipple..	XA	1	20	45	\$1.30
1213 With Porcelain Bushing	XA	1	20	45	1.30
1214 Rosette	XA	1	50	75	.80
1217 ¾-in. Fixture Loop	SM	25	100	20	.24

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SHURLOK

THE SOCKET THAT LOCKS THE LAMP

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Send us the NEW Folder
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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 40

SAN FRANCISCO, JUNE 1, 1918

NUMBER 11

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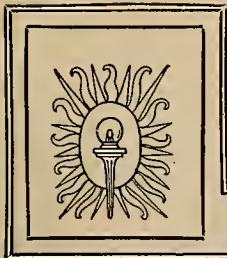
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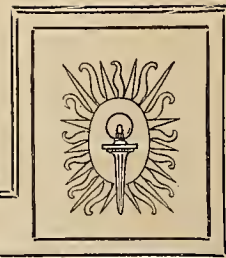


HOW THE UPBUILDING OF THE WEST IS HELPING TO WIN THE WAR—XII

Out from the innermost recesses of the great heart of the West have poured its wealth in loving sacrifice to the Red Cross and the spirit of unselfish service it represents. There is something sublime in this expression of a liberty loving people that almost overcomes one in contemplating the wonderful spirit of the nation. Like the pent-up energies of the great water powers of the West, this on-rushing spirit seeks expression. Nor will it rest from its ceaseless activity until all nations and all peoples come to the realization of unity of life and brotherhood of man.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, JUNE 1, 1918

Number 11

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THE HOPE OF A NEW TOMORROW

There is considerable hue and cry in these strenuous days of international crisis as to what may be the outcome if governmental control of public utilities continue after the war. Some argue that while today the incentive of patriotic duty and the necessity for individual sacrifice are sufficient to hold the services of men capable of conducting these great businesses that on tomorrow, with the restoration of normal conditions, the opportunities for the exercise of personal initiative and ability will be so numerous that the best men will again turn their attention away from public service to personal profit. The questions are asked, "What is the use of economical management, what is the encouragement to improve the efficiency of apparatus or operating conditions, what is the spur to greater action, when personal initiative is smothered and private ambition is stifled?" And as a consequence the conclusion is drawn that great as are the dangers of uncontrolled profiteering, they are dwarfed into insignificance when compared with the possibility of the dead level of mediocrity. In view of these smothering, pessimistic statements, were it not for a renewed, revitalizing hope of a new tomorrow, the human race might well cease to struggle for a recognition of world-wide democracy and pass on into oblivion under the tyrannical sway of imperialism.

What, then, is this renewed, revitalizing hope for a new tomorrow? One thing is certain and that is that democracy's victory will not only be complete in the conduct of the affairs of nations but of corporations and groups of individuals as well, and that fair play and proper reward for service will be given. Another thing is certain, and that is that the splendid ideas of unselfish service inculcated in the throes of this terrible world war will not die with the conclusion of world peace, nor will men of broad, constructive vision seek service for private individual ambition under the regime of former days. The housecleaning and the purging of individual and corporation selfishness must not cease until the product becomes 100 per cent fine. When this is accomplished, those men and those corporations that are manifestly fair and aboveboard and offer constructive service to the nation will continue in their operation as of yore, but the former selfish type will not.

The hope of a new tomorrow is, then, that selfishness and greed, having in large measure passed from the human consciousness, the new tomorrow will see unselfish service emblazoned upon the banner of a constructive citizenship, and holding in mind this hope we may now at this time continue to meet the new issues that arise day by day in the best light of understanding given us, and leave these vexing problems of ultimate or partial ownership for solution when they come up to be solved.

In a word, the proper solution of today's problems and today's problems only, is the one safe basis upon which we may hope for wisdom and experience to handle those of tomorrow.

But with the lessons well learned from these days of trial, the dawn of a new tomorrow will certainly usher in a period of world development worthy of the sacrifice of today—a period of world development with its trying problems, too, for solution, yet with a broader humanitarian spirit fully capable of handling every new situation.

Thoughtful men in looking back over the past semi-monthly period can not help but come to the forceful conclusion that never before in the history of the electrical industry in the West have events of such importance taken place as those which transpired at the recent joint convention of the California Association of Electrical Contractors and Dealers, the Pacific Division of the National Electrical Supply Jobbers Association, and the Pacific Coast Section, N. E. L. A.

What Happened at Del Monte

Summarizing the several important events of the convention, briefly they may be detailed as follows:

For the first time in the history of the electrical industry three separate conventions representing different branches of the industry met under one roof.

The war service idea of these great conventions was carried through in magnificent detail. In the engineering discussions the possibility of increased economies was brought out, the seriousness of the fuel oil situation dwelt upon, while in the general sessions of the convention, the public policy committee recommended positive action to help alleviate the obstructions in the way of immediate new power development upon the public domain by recommending the insti-

tution of a publicity campaign that would enlighten the public of the dangers that threaten the industrial and agricultural activities of the nation in the immediate future if some action be not taken.

Early in the convention proceedings was held a women's war service session, conducted by women of the convention who very ably and convincingly brought out the new sphere of activities and duties that women must fulfill in the industry due to the exigencies of the war crisis.

Then there was the grand war service banquet on Friday evening. Few will ever forget that wonderful fifty-five minutes in which Professor Charles Mills Gayley, a speaker and writer of international note and Dean of the Faculties at the University of California, held his audience of four hundred eager listeners in his description of war service ideals in these trying times.

Then, too, in the commercial section meetings of all three of the conventions the spirit of a desire for closer, more helpful workable relationships between all branches of the industry was evident on all sides. This spirit, which has been developed to such a high degree in the West during the past year, reached its climax at the various sessions of the convention in the unanimity with which the "Goodwin Plan" was adopted in the various formal and informal sessions of the conventions.

But the one fact that stands out above all others is the protest that was evident on all sides against the closed meeting in all future discussions of every nature, kind and style that have to do with problems that affect the welfare of the electrical industry either as a whole or in its various branches of activity.

And finally, above all, was developed among the men and women who attended these conventions a closer understanding of the responsibilities of citizenship and of mutual helpfulness in public and private life at a time when the efficient maintenance of our industry means so much to civilization in this period of world crisis.

It is interesting to note how the Wheatstone Bridge analogy applied by W. L. Goodwin to some of the ills of the electrical industry may be used to picture the proper balance in handling organization details of the various societies now of importance in the industry, and thus present a working basis so that overlapping of effort may be avoided.

On another page of this issue a picture is shown which sets forth in detail the Wheatstone Bridge analogy of Mr. Goodwin. In this view is exhibited how capital may be made to enter the industry from the public through the manufacturer, thence through the electric light and power company or the wholesaler, thence through the retailer to the consumer. If now these separate industries be replaced on the chart by the manufacturer's association, the national electric light association, the electrical supply jobbers association and the contractor-dealer's association, the Wheatstone Bridge again becomes a beautiful illustration for maintaining a balance. The capital entering the four organizations in the nature of dues from the members, who in this instance replace the public,

as shown on the chart, is made to flow through all the four organizations with the result that statistics, data, and commercial efficiency are the outcome. Finally, stability and prosperity, indicated by the galvanometer, are brought about by an advisory committee, representative of all four organizations, which serves as a sensitive registering device for the noting of a want of balance.

A gigantic rally under the auspices of the California Electrical Co-operative Campaign is to be held in San Francisco on June 7, 1918, as announced elsewhere in this issue of the Journal of Electricity. The attendance of all men interested in affairs electrical is urged. Only by means of such meetings as this does further co-ordination of effort become possible. And in this co-ordination of effort due deference to the Wheatstone Bridge analogy will prove very helpful.

To properly mobilize the activities of an industry, it is well that the economic functioning of material forces be performed with the utmost degree of efficiency. When all is said and done, however, the proper utilization of human energy is the greatest of all necessities.

The Mobilization of the Electrical Industry

The electrical industry in the West, now so universally recognized as a leader in world thought along lines of mobilization of national forces, can do well to ponder further how even greater results may be accomplished. Until national laws are enacted that will see to it that idleness of any sort be prevented, much can be accomplished by voluntary action on the part of men and women in the industry to see to it that every man and woman be employed in some useful occupation.

Our progressive ally to the north has recently taken a most advanced step forward in this regard. In view of the fact that men of military age are a most pressing need to provide men for the allied forces in Europe, and also in view of the equally urgent need for labor to assist in the production of food and other articles essential for war purposes, an enactment has been put into effect that will be far reaching in its accomplishment for mobilization of national energy.

Under the new enactment now in force in Canada, every male person residing in the Dominion of Canada shall regularly be employed in some useful occupation, and if convicted of violation of the enactment is fined \$100 or sentenced to imprisonment with hard labor for a period not exceeding six months in any common jail.

The exceptions to the law are interesting, and are:

- (a) Under 16 years or over 60 years of age.
- (b) A bona fide student proceeding with his training for some useful occupation.
- (c) A bona fide student in actual attendance at some recognized educational institution.
- (d) Usually employed in some useful occupation and temporarily unemployed owing to differences with his employer common to similar employees with the same employer.
- (e) Physically unable to comply with the provisions of the law as herein enacted.
- (f) Unable to obtain within reasonable distance any kind of employment which he is physically able to perform at current wages for similar employment.

There is much that each individual can do in helping to aid national efficiency and the mobilization of human effort for a common cause. The electrical industry is now recognized as an indispensable factor in helping to meet the present world crisis. Quiet thought on the part of each individual as to how each moment may be put to increased advantage combined with the synchronous helpful activity of all of our hundred million people, will net results that no human barrier can withstand. This careful watching of our time and to what use it is put is one of the ways that electrical men can forward the ultimate coming of world peace.

Recent information from the national capital relative to the war finance corporation is exceedingly interesting and timely.

The War Finance Corporation

The Federal reserve banks will continue to finance business and industry; the function of the War Finance Corporation is to finance the investment banking of the country. The functions of the banks and the corporation are complementary and full co-operation may be expected.

The War Finance Corporation will start business with a capital stock of \$500,000,000, all subscribed by the United States Government, and will have authority to issue bonds to the extent of \$3,000,000,000 with which to finance its operations.

The corporation will make loans to banks and trust companies making loans to finance "operations necessary or contributory to the prosecution of the war." These loans will be made for periods not exceeding five years and in sums not more than 75 per cent of the face value of the loans made by the borrowing banks to finance "operations necessary or contributory to the prosecution of the war." The notes of the borrowing banks taken by the corporation for these loans will be secured by adequate collateral.

The corporation may also make loans to savings banks and building and loan associations under certain circumstances, and may in some cases make loans direct to industries essential to the war.

Just as a large amount of the man power of the nation must be devoted to war purposes and a very great portion of the material and supplies of the nation must be devoted to the same purpose, just so a great deal of the money and the credit of the country must be derived from ordinary channels and devoted exclusively to purposes essential or contributory to winning the war.

Industries and business essential or contributory to war purposes must be afforded necessary financial assistance even if other ordinarily valuable industries are curtailed in their credit thereby. The War Finance Corporation is the government instrument for the conservation of the credit of the nation, conserving it for the purpose of winning the war.

In the West the attitude of the War Finance Corporation will be watched with keenest expectancy. In this vast section of the nation agriculture is in many instances entirely dependent upon hydro-electric power for irrigation. In one commonwealth of the West during the past year the agricultural production alone totaled a billion dollars. Then, too, ship building now proceeding by such rapid strides in Western sea ports is delicately interlinked with hydro-electric power supply. Fuel oil so necessary in steam electric generation is in a critical stage as it is estimated the surplus storage will be exhausted within a year. Added to this is the fact that there is a serious possibility of shortage in water supply due to light precipitation in the mountains in many sections of the West during the current season.

To properly handle the situation immediate and ample financial relief must be given to hydro-electric activity in the West by the War Finance Corporation.

One of the most helpful factors in reaching the public ear and the securing of a sane and reasonable hearing of the pressing needs of the early solution of utility war problems, especially those relating to the necessity for the increase in rates, is the large amount of utility stock that is held by customers in many localities of the West.

The Customer Ownership Ideal

An eminent Eastern authority along utility financial matters has recently stated that the ideal system of ownership is that where each customer has a proprietary interest in the utility in proportion to the service rendered him. The eventual mutual ownership of public utilities is the best from the standpoint of the customers and from every social and economic view.

There is still a vast opportunity of extending this mutual ownership idea in countless districts throughout the West. Such a movement, if carried to the possible limit, would greatly promote community and individual thrift and prevent public utilities from serving as a bone of contention in politics. There would then be no demand for ownership by the municipality and the problems of regulation would comprise only those of seeing that the charges for service were equitably distributed as between the different classes of customers.

While it is true that the tremendous drain upon the investing public makes the sale of utility stocks to customers of considerable difficulty at this period, still it is surprising to note the splendid results attained by several great utilities in the West during recent months.

In view of this recent success, the further extension of the customer ownership ideal is well worthy of further consideration.

THE NEW JOURNAL SERVICE: Due to the importance of the discussion that developed at the recent Del Monte conventions, more space has been allotted to this subject in this issue of the Journal of Electricity than originally contemplated. As a consequence, it has been thought best to postpone for a later issue the matter pertaining to summer uses of electricity which was announced for this number in the last issue of the Journal of Electricity. The next issue of the Journal of Electricity will feature commercial and engineering data relative to the development of China. This will be a new departure in technical journalism and should meet a present day need in the West, due to the gigantic increase in commercial and engineering relations of Pacific Coast ports of the United States with Far Eastern points.

INDUSTRIAL ILLUMINATION

BY F. H. MURPHY

(The importance of efficient industrial illumination can hardly be over-estimated in these days of stimulating production—and indeed many plants have revised their lighting systems during the past year purely as a war measure. A most valuable review of some of the most up-to-date industrial lighting installations in the vicinity of Portland, with a study of the principles involved, is here presented by the illuminating engineer of the Portland Railway, Light & Power Co.—The Editor.)

The present war has undoubtedly done a great deal to emphasize the importance of good illumination in industrial plants. In order to keep up with the enormous demand for products it has been necessary for many plants, which have heretofore been operated on only one shift, to increase to two and even three shifts per day. This has meant more light and better lighting than has been in use before in the majority of cases in order that the night shifts should not fall down in either speed or accuracy. That this condition may be realized it is necessary that the rooms be reasonably well lighted throughout, that an illumination intensity comparable to that of daylight be provided at all places where speed and accuracy are important, and finally that glare be eliminated.

Unfortunately, in many cases, quantity has been mistaken for quality, with the resulting lack of efficiency. However, there is a growing realization of the fact that the problem of securing a proper system of illumination is one requiring the services of an expert, no less than does any other highly specialized work in connection with an organization.

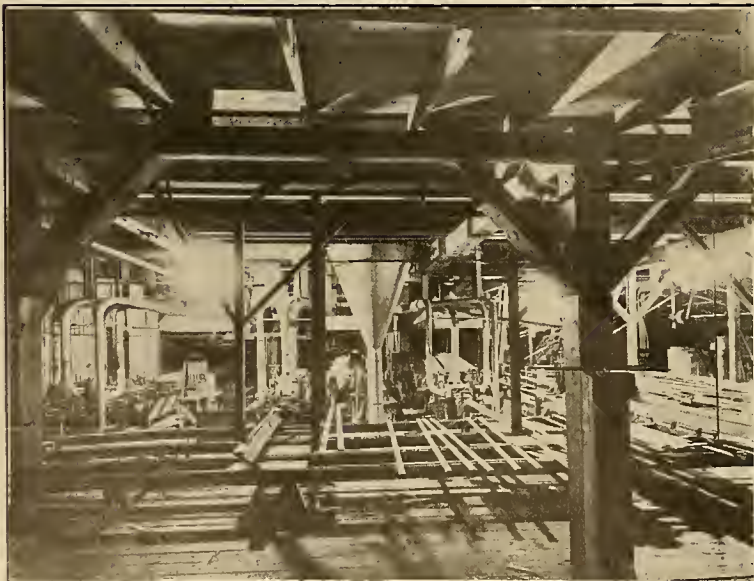
Many of the more progressive organizations did appreciate the advantages of a correct lighting installation, even before the press of war demands was felt. The examples which are shown herewith are installations of this class. The cost of operation of these different installations is a relatively small item and they meet the requirements set forth in the opening paragraph as to what is necessary for a good lighting in-

stallation. The cuts are reproduced from untouched negatives taken in the various rooms between 9 and 10 p. m. The negatives were given a time exposure under the light of the installation itself.

In conclusion it is well to bear in mind that even with normal wage conditions a well-designed lighting system can be shown to pay for itself in the saving alone of the employees' time, to say nothing of the saving in spoiled material. How much more, then, would this be true in the case of present day wages.

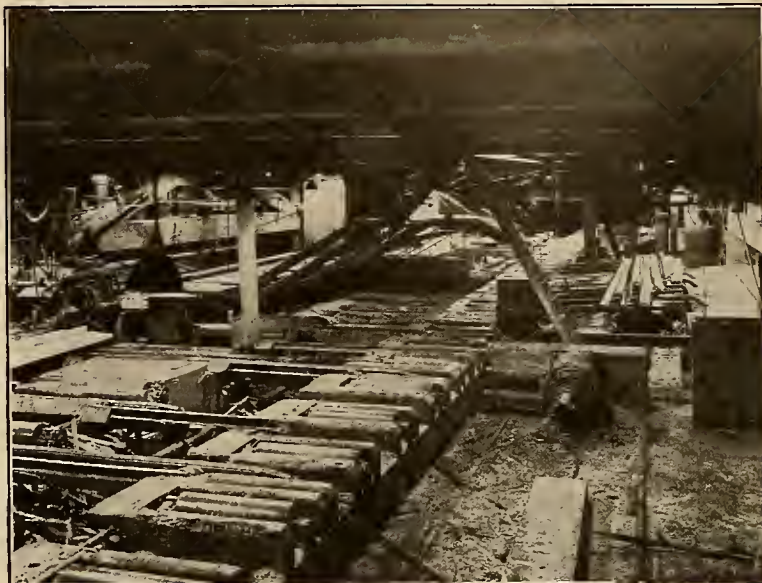
The annual saving also of damages, due to avoidable accidents which can be prevented by adequate general illumination, will usually more than offset the annual energy and maintenance cost in addition to the first cost of installation.

There is still another phase of the situation that is rarely given proper consideration and that relates to the physical and psychological effect upon the employee. Either a glaring installation or one with insufficient illumination will cause eye strain with all the attendant physical evils, in addition to spoilage, decreased speed and increased accident liability. Furthermore, these conditions breed irritability, discontent and lack of harmony, leading to a larger labor turnover, and even at times to possible strikes. These are not wild dreams or theories, but are actual facts which have been proven often and which must be faced whether believed in or not. Illumination is a phase of plant operation that insists upon intelligent treatment, otherwise it will exact its own revenge; and like nature herself the penalty is inexorably exacted regardless of political or commercial influence or belief.



A view in the planing section of one of our more progressive lumber mills. The wattage per square foot used in this location is approximately .33. The general illumination is accomplished by means of 400 watt Type "C" Mazda lamps installed in standard industrial units with enclosing globes and reflectors, placed approximately 33 feet apart.

A view in the trimmer section of the same mill. The wattage per square foot in this case is approximately .37. The illumination is secured by means of smaller lamps, varying from the 25 to the 60 watt size and installed in deep bowl porcelain enameled steel reflectors, some of which are clearly visible in the picture.



A view of the main sawmill, showing the log deck, carriage and saw. The intensity required here is greater than in the two previous locations and the wattage per square foot in this case is .53. The lighting units used are 100 watt Type "C" Mazda lamps in deep bowl porcelain enameled steel reflectors.

A section of the main floor of a large dock. The wattage per square foot in this space is approximately .16, yet it is clearly evident from the picture that it is possible to carry on all the work necessary in such a place as satisfactorily as in the daytime. 200 and 300 watt Type "C" Mazda lamps installed in deep bowl porcelain enameled steel reflectors mounted high above the floor are used in this case.





A section of the lower level of the same dock in which the wattage per square foot is approximately .16. In this case the installation consists of 100 watt Mazda lamps installed in deep bowl porcelain enameled steel reflectors mounted on the ceiling of the dock.

A view in one of the large warehouses connected with the docks previously referred to. The wattage per square foot used in this warehouse is .12 and the installation consists of 250 watt Mazda lamps installed in deep bowl porcelain enameled steel reflectors mounted approximately 20 feet above the floor. This installation was made before the advent of the Type "C" lamps and the 250 watt lamps will undoubtedly be replaced eventually by 200 watt Type "C" lamps. As may be readily seen from the cut, it is possible to transact all warehouse business without any delay caused by lack of light in any portion of the room. This is accomplished by means of an expenditure of energy of only .12 watts per square foot, an item which is entirely negligible when considering the advantage obtained from it.



A view in the loom room of a large woolen mill. This room is provided with both general and special illumination. The general illumination is accomplished by means of 100 watt Mazda lamps installed in deep bowl distributing X-Ray reflectors, mounted approximately 13 feet 6 inches above the floor and using approximately .2 of a watt per square foot. 40 watt Mazda lamps installed in deep bowl porcelain enameled steel reflectors of the concentrating type are used for providing the special lighting for the looms. The looms are all arranged in pairs facing each other, the special illumination is so arranged that two lights are provided over the front of each loom and one unit is used to light the passage way between the backs of two adjacent looms. This installation has been in use for some time and is giving entire satisfaction. The glare spot on the right of the picture is produced by means of a bare lamp which for some unknown reason has been hung in that location and which was overlooked by the photographer.



ELECTRIC COOKING AND ELECTRIC RANGES

BY H. C. HOPKINS

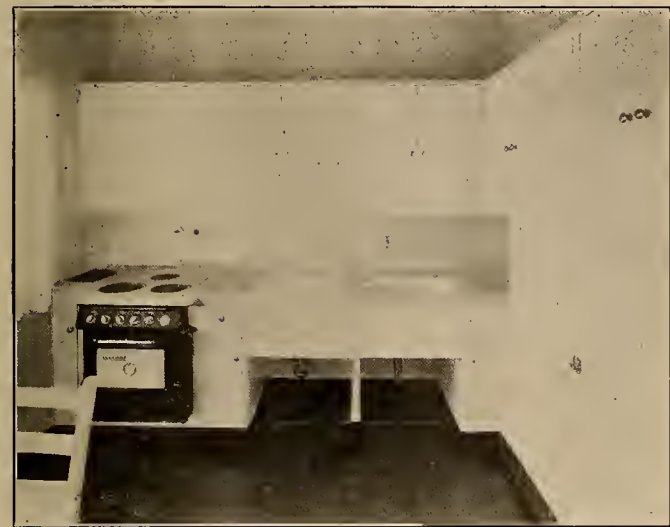
(It is a significant fact that in spite of the war, with its attendant rise in prices, and the fact that power companies as a whole have not pushed their domestic business, electric range sales have steadily increased throughout the country. This means larger electricity bills and a chance to make the domestic load provide a reasonable profit. The situation in this field is here interestingly analyzed by a man who is industrial engineer with the sales department of the Westinghouse Electric & Manufacturing Co., San Francisco office. The paper is one which was given recently before the Nevada Section of the N. E. L. A. at Reno, Nevada.—The Editor.)

The subjects of electric cooking and the development of the electric range business has received such an abundance of publicity during the past two years, that it becomes a difficult matter to offer any original thought or ideas on this subject. Most of the information contained in this paper is therefore of necessity a repetition of information previously published.

At this particular time, when our country is in a fever of war preparation, and the usual fuels, such as coal, oil and gas, are required in the industries in a larger measure than ever before, the necessity of utilizing electricity for home fuel requirements becomes almost a patriotic duty. To reduce the consumption of coal and oil in the homes, substituting therefor elec-

sideration, which cannot always be stated in terms of money.

Statistics compiled by various central station sales managers show that at the present time the average cost of installing an electric range is approximately \$79. The average current consumption is approximately 1111 kilowatt hours per year. The average revenue per year is \$42. The figures cited are by one concern only. The installation cost, however, is fairly uniform at the price mentioned. The revenue per year per range will vary considerably, ranging from \$35 to \$48 per year, depending upon the price obtained for current. In the case cited above, the revenue per year is actually 53 per cent of the installation charge.



AN ELECTRIC RANGE IN A RENTED APARTMENT

The convenience and safety of the electric range is a greater argument than money economy—and just as it pays for this owner to make his flat inviting by electricity, so it pays the householder to bring comfort to his own home.

tricity, means a vast conservation of fuel and in addition relieves greatly our already overburdened transportation systems. At the existing price of coal and oil, the increased use of electric ranges will also mean a direct saving in household expenditure, thus relieving economic pressure occasioned by the continued rise in the cost of living.

The high prices of coal, gasoline and kerosene makes the present a most opportune time for the development of the electric cooking business, as in a great many cases, electric cooking is accomplished at less cost than with the fuel mentioned, without considering the many advantages obtained by the use of electricity for cooking.

The central station is of course interested in the development of this or any other business, primarily for the monetary benefit to be derived. However, there are other benefits which should be given serious con-

Statistics on Electric Range Installation

Ranges Installed	Average No. of Persons in the Family	Average Active Kw. . .	Average Kw.h. per Year	Average Revenue per Year.	Average Kw. per Month . . .	Average Revenue per Month
69	3.4	3.6	1111	42.28	93	3.52
Average Cost of Inside Wiring.	Average Cost of Service		Average Cost of Trans. and Meter	Total Average Cost of Installation	Average Rate per Kw.h.	
20.13	17.83		40.95	78.91	3.8	

Idaho Power Co.—Month of February, 1917

No. Ranges Installed	Total Net Revenue	Lowest Net Revenue	Highest Net Revenue	Average Net Revenue
146	379.60	.90	7.25	2.60
85 per cent of all bills were under \$3.88				

It has been proven that the electric range load is purely a day load.

Instead of a lighting customer whose bill is usually so small that it hardly pays for the cost of book-keeping, the customer, using electric cooking, increases the size of his monthly bill at least three times.

The cooking load is particularly valuable to the small central stations or central stations operating in small towns, as it is a day load and makes 24 hour service profitable, particularly where power service is limited. Any development which will bind the customer more firmly to the central station company is unquestionably a valuable asset.

The development of electric cooking during the past two years has been very rapid. New methods of

construction, the use of the best quality of materials available, and high grade workmanship has resulted in the development of a line of ranges which are conceded to be satisfactory in every respect. This is conclusively demonstrated by the fact that there are at the present time over 15,000 ranges in use in the United States. In spite of the continued increase in the selling price of ranges, and in spite of the numerous obstacles which the central stations have had to encounter during the past year, the demand for electric ranges appears to be as great as ever.

The tendency to reduce active solicitation of range business by the central stations, naturally led to a flattening of demand in some localities, but on the other hand, the result of the past two years' educational work is being felt, and in localities where electric ranges are already in use, new customers are demanding service.

It is of course desirable for a central station contemplating development of the range business to standardize on one or two makes of ranges. A suitable stock of repair parts should also be carried, so as to insure the customer the very best possible service in case of trouble.

Standardizing on one or two makes of ranges, reduces the investment in repair part stock to the minimum. Furthermore, salesmen and trouble men quickly become expert when only a few types of ranges are handled, whereas if every type of range on the market is purchased indiscriminately, these men cannot be expected to absorb all the details of construction and operation of every make.

The ranges offered for sale by the leading manufacturers today can all be classified as reliable and satisfactory. Some, of course, have distinctive features, which do not appear in others. However, it is generally understood that a satisfactory and efficient range should embody the following features:

The body and frame should be strong and built to stand hard usage.

The ovens should be well lagged to reduce radiation losses to the minimum.

The heating unit should be made of the very best resistance material available.

The switch control should be as simple as possible, and should be plainly marked.

All ovens should be equipped with reliable temperature indicating devices.

The finish should be pleasing, durable and inexpensive.

The above are the main features which are indispensable. Each range manufacturer naturally advocates other features which are distinctive of his particular product.

Any sales campaign or sales effort calculated to promote the use of electric ranges must of necessity be of an educational nature. It is almost impossible to sell electric ranges unless the idea of electric cooking with its numerous advantages is first proved to the prospect. Unless the advantages of electric cooking are thoroughly understood and appreciated by the customer, the inevitable result is that the user makes a comparison of the cost of operation with the fuel previously used for cooking.

The result of such a comparison is not always favorable to the electric range, particularly where the cost of electricity is higher than 3 cents per kilowatt

hour. The customer would not think of comparing the cost of his electric light with the cost of gas or oil lamps, simply because he thoroughly understands and appreciates that he is obtaining better light and better convenience than he formerly enjoyed, and this represents to him a definite value in convenience and comfort.

The advantages and benefits to be derived from the use of electric ranges are numerous. The electric range is sanitary and clean. The products of combustion—ashes, soot, or fumes, are entirely eliminated, making it easier to keep the kitchen clean, sanitary and more cheerful, with a resultant saving in labor and cost of refinishing the walls and housecleaning.

Practically all of the heat generated is used for cooking; consequently, the temperature of the kitchen is not raised.

Cooking can be performed with mathematical precision, eliminating guesswork entirely. This is due to the perfect control and easy regulation of temperature. The time ordinarily spent in preparing and watching the food cooking in a coal or gas range is very considerable, and can be saved and used to better advantage when this modern heating agent is utilized.

The saving in meat shrinkage is quite considerable, ranging from 5 to 15 per cent. This is an important feature, particularly in these days of food shortage and high cost of living.

Furthermore, the quality of the food cooked is considerably improved, the natural flavors being retained instead of being allowed to escape with the products of combustion.

Any device that will add to the safety of the home is commendable. The use of electricity displaces matches and open-flame fires. Matches alone are dangerous, causing over \$3500 worth of fire damage yearly. Matches are also poisonous, and statistics show that approximately 1000 children die yearly from sucking and eating match tips. There is no gas to explode and no flame or flare up to start fires or burn the operator.

No business man would think for one moment of going back to the old office methods and discarding the use of such modern labor-saving devices as typewriters, billing machines or adding machines. These devices are considered necessary to the proper and efficient management of one's business. The use of electricity in the home is simply a modern labor-saving instrumentality, saving money, labor, time and worry, and therefore should be considered as part of the modern housekeeper's equipment.

The points brought up and others which are readily available should be thoroughly understood by the range user or prospective user. In other words, if the central station can create the desire in the mind of the prospect for this modern service with all its efficiencies and advantages, it will not be necessary for the central station solicitor to actually sell the range; the prospect will take care of that part of the transaction by actually buying the range.

To properly promote the use of electric ranges, the central station employees should be induced to install electric ranges, so as to obtain first hand information of the actual cost of electric cooking and the advantages to be derived.

An employee who is an enthusiast will naturally talk ranges to his friends, and acquaintances, and will be able to locate prospects during his daily work and when he comes in contact with the central station's lighting customers.

Electric ranges should be publicly demonstrated on every possible occasion, and all prospects secured from such public demonstrations should be actively followed up by competent salesmen.

Literature should be mailed such prospects from time to time. Leaflets showing the actual cost of operation of electric ranges, installed in the prospect's neighborhood, have been found very effective.

Such leaflets should show, in addition to the cost of operation for several months, the name and address of the customer owning such range. This will do more to eliminate the belief that electric cooking is expensive than any other plan.

The domestic science school furnishes a very good medium for educational work, and special effort should be made to install electric equipments in the domestic science department of all high schools. Experience has shown that girls who have been trained to the use of the electric range will talk electric cooking in their homes, and are in many cases instrumental in getting their families to purchase electric ranges.

All such sales and educational activities should of course be backed up by sound and sensible advertising in the newspapers, or by any other means which are suited to the particular locality.

It is such educational work that has placed approximately 15,000 electric ranges in American homes, and that has developed a definite market and demand for electric cooking. The so-called Whirlwind Campaign plan has not been found applicable to the development of this business, but on the other hand, has been found extremely unprofitable and expensive.

PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(The principles of inductive interference which are at the base of one of the most important problems now under discussion by electrical men, themselves involve only simple electrical phenomena. This clear and concise explanation has been prepared for readers of the Journal of Electricity by a man who was prominent in the investigations recently carried on by the California Joint Committee on Inductive Interference.—The Editor.)

The flow of electricity (electric current) when the voltage or potential difference to earth of a conductor is varied, was considered in the preceding discussion, and it was shown that electric currents are set up in neighboring circuits, proportional to the voltage of the disturbing circuit. This action is termed electrostatic or electric induction. The induced current has the same frequency as the voltage of the disturbing circuit. Thus, suppose a trolley wire to have a "direct" potential of 600 volts to earth plus a high-frequency component due to the slots in the generator armature of 3 volts effective value at 1500 cycles per second. After the transient of starting has subsided, there will be no induced current in a neighboring wire due to the 600 volt direct potential, because it does not vary and hence causes no variation of the amount of electric charge. But the 1500 cycle slot-harmonic voltage causes a current of 1500 cycles frequency in the neighboring circuit.

The action of the electric charges, already described, is that which takes place in an electric condenser as commonly used in telephones, induction coils and radio sets. That is, a wire and earth, or two wires, act like the plates of a condenser. The "capacity" (more correctly, capacitance) is very small. For example, a 4/0 wire 25 feet above earth has capacitance to earth of 0.01 microfarads per mile, while

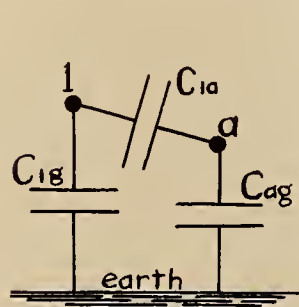


Fig. 1-A.

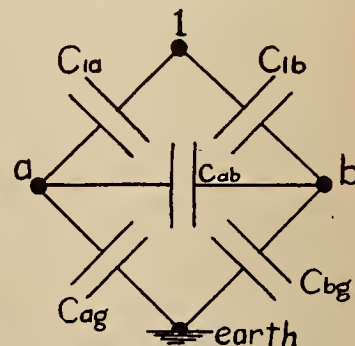


Fig. 1-B.

Equivalent condensers to represent electric induction

the condenser in a telephone set, composed of paper and lead-foil, has a capacitance of one microfarad (one hundred times as great) in a space about 2x4x1 cubic inches.

To study electric induction it is very convenient to replace the actual wires by equivalent condensers. In the simple case of a disturbing wire "1," a disturbed wire "a" and earth (always assumed at zero potential) we can imitate the actual exposure by three condensers as shown in Fig. 1A. If wire 1 has a potential E_1 at a given instant, the potential of wire a is $E_a = E_1 \times C_{1a}/C_{1a} + C_{ag}$ if wire a is isolated within the exposure. E_a is thus not dependent on the length of the exposure. But in ordinary operation a is connected to unexposed wire and apparatus. These reduce the voltage of a to ground by providing a path for current through the connected line and apparatus. Knowing E_a and the impedances in the circuit, the amount of this disturbing current can be determined.

Fig. 1B shows the case of a disturbing wire 1 and a two-wire disturbed circuit a, b. It has been drawn like the usual figure of a Wheatstone bridge to better illustrate the effect of transposing a and b, and also to show the importance of equal or "balanced" relations to earth of a and b.

Insulation resistance, unexposed line and terminal apparatus of circuit a, b could be represented by impedances in multiple with condensers C_{ab} , C_{ag} and C_{bg} . By properly transposing a and b we can make $C_{1a} = C_{1b}$. Then if $C_{ag} = C_{bg}$ we have the equivalent of a balanced Wheatstone bridge, with no difference of potential and no current from a to b, hence no disturbing current in circuit a, b. But any unbalance in the impedance of a and b to earth destroys the balance of the "bridge" and causes current in circuit a, b. Hence the very great importance of balancing communication circuits to earth, as well as to the disturbing circuit. The effect of decreasing E_1 or of increasing the separation of the disturbing and disturbed circuits is to make E_a and E_b less, hence reducing the disturbing current.

PACIFIC COAST ENGINEERING PROBLEMS

(The discussion at the recent Del Monte conventions brought out much that is valuable in solving electrical problems of the West in the present crisis. The report of the first day's session was begun in the last issue of the Journal of Electricity and is continued here, together with discussion as brought out in the remaining sessions of the Engineering Section.—The Editor.)

POSSIBLE WATER POWER DEVELOPMENT IN CALIFORNIA

Edward Whaley in a discussion of F. H. Fowler's paper on this subject, contributed the following:

There is undoubtedly existing today a critical condition in the power markets of Central and Northern California, aggravated by subnormal conditions of rain and snowfall, a rapidly increasing demand for power and the necessity for curtailing the use of fuel oil in order that this form of fuel may be available in adequate quantities for maritime needs and other war activities for which no other source of power can be substituted. It must be admitted without argument that fuel oil must be conserved to the greatest extent possible and that agricultural and war production demands for power must be met and that in California, at least, this can be done by the substitution of power generated by falling waters.

In Mr. Fowler's able exposition of the subject he has shown, and in fact it is and has been a matter of common knowledge, that the possibilities of hydro-electric development in this state are ample to meet all demands that may be expected for many years to come; but we are now faced with a situation of national importance in which two factors are of primary importance, viz: the delivery into the market of a large block of power and the delivery of this power in the shortest time possible. Any discussion of the problem which does not realize these two factors as absolutely controlling in the present emergency is purely academic.

As between two or more developments of sufficient magnitude, that development should be made which can be placed in operation within the shortest time.

The next point for consideration is the number of man power days necessary for completion and the season when same will be required. This is of particular interest both as to the total amount of labor to be drawn from an already insufficient supply and also as to the ability to prosecute all or a considerable part of the work under favorable conditions throughout the winter months, when the call for labor for planting and harvesting is non-existent.

The final point for consideration is the amount of money which must necessarily be diverted from other purposes to furnish the necessary amount of power to fully meet the present emergency. From all present indications the war promises to be of such a duration that the financial resources of the country will be strained to the utmost before a victorious conclusion is reached and it is only sane procedure to accomplish all necessary results with the minimum of expenditure now, when the burden seems comparatively light.

In the report of the committee representing electric utilities appointed by the Railroad Commission to investigate power conditions and possibilities for Northern California, and also in the report prepared

for the commission by its own engineers, it appears that a development of 100,000 horsepower at the present time in a plant capable of producing this amount continuously throughout the year as a base load will meet present requirements.

Mr. Fowler, in his paper, pointed out that there were at least three possible developments in Northern California that would produce this amount of power, namely, the combined project of the Great Western North Fork of the Feather River and Yellow Creek project of the Pacific Gas & Electric Co., the Pacific Gas & Electric Pit River project and the Northern California Power Company's Pit River project.

The development of the Pacific Gas & Electric Pit River project cannot meet the present emergency as the estimated time to complete is five years. The Feather River project has been estimated to take two and one-half years and the Pit River project of the N. C. P. Co., Cons., to take 18 months. In point of time, therefore, the latter project is in a class by itself. The entire flow line is only five and one-fourth miles long, of which approximately 10,000 feet is tunnel, divided into five sections; the longest of which is only 3450 feet in length. From this it at once becomes apparent why this project can be developed so much sooner than the Feather River project, where fourteen miles of tunnel will have to be driven.

The pipe lines are only 800 feet long, so that the demands on the steel plate mills, already overloaded and behind on deliveries to our shipbuilding plants, will be a minimum and much less than for any other development projected.

The amount of tunnels will permit the prosecution of a large proportion of the work when labor will be most available and the open ditch section is of such dimensions and the formation of such character that power driven machinery will be used largely to the exclusion of manual labor.

In point of total cost, this project will call for by far the least money, and will cost far less per unit of output than any other possible development and this low unit cost will be a low immediate cost and not one to be attained some time in the far distant future after many millions of dollars have been spent on other power plants to be finally operated as part of the one comprehensive scheme.

Mr. Fowler stated as his personal view that he favored the project of the Pacific Gas & Electric Company as against that of the Northern California Power Company, Consolidated. I infer that this preference arises out of the fact that the Northern project excludes some portions of the fall of the Pit River which are included in the Pacific Gas & Electric project, and that he is fearful that for this reason the utmost ultimate development will not be made of the latent possibilities of this stream. This is the viewpoint of the extreme conservationist, but in this case there can be no room for controversy on this point as the

topography of the country makes it perfectly feasible to include these sections of the river in other developments which will undoubtedly be made in later years.

The water resources report of 1912 shows the potential possibilities of this stream as from 450,000 to 600,000 horsepower, depending on whether flood waters are stored at its head or not. Except for that part of the stream embraced in the Northern project, those parts of the stream which the Northern excludes but the Pacific Gas includes compare favorably with the remainder of the stream as regards fall per mile so that their ultimate utilization is only a matter of time.

The original filings on this stream, together with the original surveys of both the Northern and the Pacific Gas projects, were made by the Northern California Power Company. These preliminary investigations were started in 1902 and after spending a number of years and a good many thousands of dollars, it was decided that the advantages of the present Northern project were so great as compared with any other that this ought to be the first development on the Pit River.

This decision was made after the most careful investigation had shown that this particular project could be constructed in less time and for less money than any project in the state of California, having an equal all year output. The present emergency only emphasizes these advantages and adds one more, which is now perhaps all important, and that is that, for an equal amount of power, far less man power will be requisitioned for this than for any other project.

SHORTAGE OF FUEL OIL

J. M. Buswell contributed the following: If it is true that the fuel oil supply will become exhausted in the near future to such an extent that it will be necessary to control the distribution of, not only the fuel oil, but electric energy generated by fuel oil, to what may be considered as non-essentials, it would seem advisable that the committee arrange to make an immediate survey or investigation, producing statistics that will establish the possible saving of fuel in two ways: First, by improving the load factor by changing loads from one time of day to another; that is, by improving the diversity factor of the various principal loads. Second, by reducing the peaks, by curtailing the distribution of energy to non-essentials, at least over the peak period, when it is customary to carry at least part of those peaks on steam units.

It might be suggested that these investigations be made before the crisis has been reached, so that, when the time comes, the companies will have data ready to show the field of possible fuel saving and the result of curtailment of profitable load, which will reduce the earnings, probably to such an extent as to require an adjustment of rates, in order to assure the operating companies a proper return.

WATER POWER CONSERVATION

The several papers on power conservation including the "Questionnaire" (p. 388), "Power Plant Losses," by R. J. C. Wood (p. 344); "Improvements in Water Wheel Efficiency," by E. C. Hutchinson (p. 404), and "Hydro-electric Economies," by J. P. Jollyman (p. 384), were discussed together. The discussion was opened with a written comparison of governing methods by H. A. Barre, as follows:

At the Big Creek installation there is no loss of water or power due to governing. The water conduit from Huntington Lake to Power House No. 1 is en-

tirely a pressure system, so that the whole lake is the forebay.

A pond is formed below Power House No. 1 and is connected with Power House No. 2 by a similar pressure conduit and, therefore, acts as a forebay for Plant No. 2. This pond has a draw down capacity of 53 acre feet, or enough to supply Power House No. 2 for nearly four hours.

Both power houses can, therefore, follow the fluctuations of the load without any noticeable time lag.

The control of the water nozzles is by means of a needle valve in a fixed position, which opens and closes in direct response to the governor. If the closing is at such a rapid rate that the pressure in the pipe line increases above a predetermined limit, the bypass opens and discharges enough water to prevent a further increase.

As the pressure falls the bypass closes slowly until the water is entirely shut off.

The contents of the pressure system are such that the drop in pressure on full load opening at the maximum rate, causes such a small drop of pressure that it has no objectionable effect.

The ordinary operations of closing do not produce a sufficient rise of pressure to cause the bypass to operate.

When a very rapid closing takes place, the bypass, or pressure regulator, opens and discharges for a short time, as before described.

Each pressure regulator seldom operates more than seven to ten times per month.

In fact, it may be safely stated that more water has been wasted by routine testing of the regulators than by their operation.

TABULATED DATA CONCERNING OPERATING CHARACTERISTICS OF GOVERNING AND PRESSURE REGULATING SYSTEM OF BIG CREEK PLANT NO. 2

Pipe line length	4900 ft.
Maximum velocity based on average diameter.....	13.75 ft. per second
Pressure variation at nozzle without pressure regulator:	
Closing time 2 seconds.....	Pressure rise 75%
Closing time 2½ seconds.....	Pressure rise 55%
Opening time 3½ seconds.....	Pressure drop 27%
Pressure variation at nozzle and water wasted, with pressure regulator and closing times tabulated:	
Capacity of bypass in terms of nozzle capacity.....	100%
Full capacity closing time of nozzle.....	2½ seconds
Full capacity closing time of pressure regulator.....	20 seconds
Secondary pressure rise at nozzle.....	6%
Total waste of water on short circuit is equal to full jet discharge for about	9 seconds
Plant No. 1 has the same general characteristics as Plant No. 2, but differs slightly in length of pipe line and other details which determine the pressure variation.	

C. O. Poole stated that the experience of the Southern Sierras Power Company has demonstrated the superiority of the bypass needle valve over deflecting nozzles.

John A. Koontz of the Great Western Power Co., in discussing water conservation with turbines, cited a 3 to 4 per cent saving accomplished by the use of replaceable wearing bands shrunk over the outside of turbine runners. The runners are renewed or built up by oxy-acetylene welding, thereby not only saving water but also adding to the life of the runner.

F. D. Nims of the Washington Coast Utilities Co. abstracted a paper contributed by J. B. Fiskien of the Washington Water Power Company, giving the results of an investigation of water velocities and separation of losses in a 3260 horsepower turbine installed

by I. P. Morris Co. at Post Falls, Idaho. Pilot tubes were employed in the test and every precaution taken to get the most accurate measurements. At a load of 3310 horsepower an assumed water wheel efficiency of .845 and an effective head of 53.01 feet, the total loss of head was 8.34 feet, distributed as follows:

Forebay to beginning of elbow.....	5.04%
Beginning to end of elbow	3.24%
Elbow to wicket gates	11.52%
Runners and bearing friction	68.45%
Draft tube and outlet	5.64%
Velocity head of discharge water.....	6.11%

Mr. Nims advised holding low vacuum at the end of the draft tube.

C. O. Poole concurred in the idea, but stated that to prevent hammer this was sometimes deliberately ignored.

Mr. Milford of the Northern California Power Co. stated that a 1-inch standard lip faucet installed in the draft tube had stopped all trouble from water hammer and caused no changes in vacuum head.

E. C. Hutchinson of the Pelton Water Wheel Company stated that water hammer vibrations occurred when a turbine is underloaded. If the draft tube is kept full they will not occur.

P. O. Crawford of the California-Oregon Power Company described the equipment of the new Copco plant.

J. M. Buswell of the San Joaquin Light & Power Corporation told of water saving that has been effected in several of their plants by the substitution of auxiliary relief nozzles for deflecting nozzles and by utilizing a small drop below the Crane Valley reservoir to operate a 600 kw. unit.

H. H. Schoolfield of the Pacific Power & Light Company described changes in the Natches canal whereby 50 ft. lost head was utilized to operate a 1900 horsepower turbine driving an induction generator floating on the system and operating automatically.

Paul M. Lincoln of the Westinghouse Electric & Mfg. Co., H. H. Schoolfield, J. M. Buswell, E. C. Hutchinson and J. P. Jollyman participated in discussion on the possibility of providing absolutely automatic operation of induction generators and the advantages and disadvantages thereof.

TRANSMISSION AND DISTRIBUTION LOSSES

R. E. Cunningham's paper (p. 349) was abstracted by the author.

S. J. Lisberger of the Pacific Gas & Electric Company remarked concerning the lowness of the losses shown, and mentioned the difficulty of making a real comparison of different systems because of different bases of comparison. Distribution losses are especially difficult to analyze. He believes that a reasonable number of transformer burn-outs is good operating practice, and in the replacement of old meters by new types.

H. A. Barre emphasized the high cost of high-grade service. More transformers are installed than are actually needed, expensive precautions are taken to insure continuity of service, whereas true efficiency would supply current in the shortest, quickest and easiest way.

L. S. Ready of the California Railroad Commission cited cases where the public had been educated

to expect too high a grade of service and unnecessarily large investments made to insure 98-99 per cent continuous service.

L. M. Klauber of the San Diego Consolidated Gas & Electric Company described the working of a system whereby the engineering department is kept informed of changes in load conditions so that transformers may be immediately disconnected. He also brought out the point that dairies, incubators and other forms of agricultural power utilization required a very high grade of service.

R. S. Masson of the Arizona Power Company suggested varying rates for differing service, a low rate for 95 per cent service and a higher rate for 99 per cent service.

L. S. Ready spoke of the difficulty of giving two classes of service from the same line, and suggested that a discount might be given for poor service. Complaints are largely due to lack of education.

P. M. Downing brought out several practical objections to Mr. Masson's suggestion.

J. M. Buswell explained how necessary shut-downs have been minimized by a loop system of distribution.

S. J. Lisberger showed the reasonableness of an irrigation consumer's complaint when a noon pump shut-down prevented the operation of his electric range. He recommended a 4000-11,000 volt combination in distribution line practice as being the most economical.

STEAM POWER PLANT ECONOMIES

R. J. C. Wood of the Southern California Edison Company, in contributed discussion, advocated conservation of steam used for atomization by cutting down the number of burners in service when running a boiler on partial loads. The real atomizing efficiency of a burner should be stated in terms of pounds of steam required per pound of oil burned, and not as a percentage of the total evaporation. The results obtained with burners in the Long Beach plant shows practically an inverse ratio as follows:

Lbs. of oil per burner per hr..	400	600	800	1000	1200	1400
Lbs. of steam per lb. of oil..	.410	.273	.205	.164	.136	.117

This represents from 3 to 1 per cent of the total steam used.

The advisability of extra heat insulation for boilers is purely an economic question dependent upon the price of oil and the number of hours per annum of boiler service as compared with the cost of insulation. Likewise with soot-blowers, which remove misplaced heat insulation.

Draft gages, CO₂ recorders and temperature indicators are well worth while in the boiler room if in charge of a competent man responsible for their upkeep. Otherwise, only disappointment will result.

A rough and ready rule for determining the proportion of electric and steam driven auxiliaries to be used is to use steam up to the point where the feed water will not absorb any more. A glance at the exhaust pipe will indicate if any exhaust steam is being wasted; and if so, some steam driven auxiliaries should be shut down and the corresponding electric driven units started in their place. Mr. Wood has had the same experience as the San Diego Consolidated Gas & Electric Company in choking the steam passages with an excess of condenser tubes and getting an increase of vacuum after removal of some tubes.

W. G. Vincent, Pacific Gas & Electric Company, noted a variation of from 1 to 4 per cent of steam required for atomization by different companies reporting, and suggested investigation by a sub-committee.

Chas. S. Delany, Pacific Gas & Electric Company, pointed out that 90 per cent of engine room efficiency is due to design and 10 per cent to operation, whereas in the boiler room operation is the all important thing. The boiler room should be well equipped with instruments that will give the operator full information about conditions and also check up his work. Such scientific methods will increase plant efficiency at least 10 per cent over haphazard operation.

Any endeavor to maintain continuity of service detrimentally affects the efficiency of the plant. Today efficiency is paramount to continuity of service.

S. J. Lisberger contended that the term kilowatt hours per barrel of oil is misleading as applied to Pacific Coast plants with low load factors. A curve plotted to show the barrels of oil burned as compared with the number of kilowatt hours generated gives approximately a straight line which is a good index of standby requirements of a plant and also an incentive to plant operators in trying to improve efficiency.

W. G. Vincent deduced the equation of this line as $bbl. \text{ of oil} = C + aX$, when C is a constant depending upon the boiler equipment of the plant, A is a constant dependent upon the kind of oil and X the number of kilowatt hours generated.

John A. Koontz explained that the high efficiency shown by the Great Western Power Company plant was due to the method of operation either under full load or solely as standby, the hydro-electric plants taking care of variation in load.

R. S. Masson described the refinements introduced in the new plant of the Arizona Power Company near Jerome, where oil costs \$2.50 per barrel. An efficiency was obtained of 1 lb. of oil per kw. hr. under test conditions (334 kw. hr. per barrel) and 256 kw. hr. per barrel under actual operating conditions with 29 per cent load factor. The initial cost was \$105 per kilowatt of installed capacity.

Edwin A. Rogers has found that the elimination of the human element in the boiler room greatly improves efficiency. He described an installation of the Merit oil firing system and of Cope regulators in the Palace Hotel, San Francisco, where from 79 to 80 per cent average operating efficiency is obtained and two firemen eliminated. This 4 per cent saving in fuel and \$200 in labor gave a total saving of \$500 per month.

Geo. E. Quinan of the Puget Sound Traction, Light & Power Company contributed answers to the questionnaire received from various members of the Northwest Electric Light and Power Association.

POWER PLANT ECONOMIES IN THE NORTHWEST HYDRO-ELECTRIC ECONOMY

1. What percentage of the theoretical energy in the water taken by any of your power houses is realized at the busbar?

Washington Water Power Company—Post Falls, 81.4%; Little Falls, 84.1%; Long Lake, 83.5%—on guarantees.

Oregon Power Company—85%.

Portland Railway, Light & Power Company—We have no means in use whereby this is determined.

2. Where this is known, how do you measure your water?

Washington Water Power Company—Water wheel tests were made at Little Falls. Practically same method was followed for the tests at Post Falls.

Oregon Power Company—By flow meter and cross section.

Portland Railway, Light & Power Company—See answer to Question 1.

3. To what extent does it pay to get an accurate measurement of the amounts of water going through your plant?

Washington Water Power Company—It paid well to accurately measure the water going through the wheels while under test, as the efficiency was a material factor in determining the price to be paid the manufacturers. Except for this reason it does not pay in any degree to measure the

water going through the plants accurately. A general knowledge of the amount of water which is drawn from yearly storage through the Post Falls plant is all that is necessary and this is arrived at from the load carried by the plant.

Portland Railway, Light & Power Company—See answer to Question 1.

4. Have you on impulse wheels any automatic system of closing needles to reduce deflection of nozzles, or of closing bypasses opened by falling loads, and to what extent do they improve your water economy?

Portland Railway, Light & Power Company—Do not have any impulse wheels installed.

5. Have you any cases of special value involving the use of forebays or afterbays to avoid spilling water on account of daily load variations?

Washington Water Power Company—See Question 8.

Oregon Power Company—Yes.

Portland Railway, Light & Power Company—Every forebay is of value in carrying our load, which has less than 100% load factor. We have two hydro stations with forebays which are of special value in carrying less than 100% load factor loads.

6. Have you any information of the effect of bucket wheel renewals in efficiency, and can you throw any light on the problem as to when it pays to replace buckets to maintain efficiency?

Oregon Power Company—This company operates two 18-inch double horizontal Victor turbines in its Albany Plant under a mean head of 48 feet. Quite frequently the buckets are broken out and the efficiency of the wheel considerably reduced, according to the number broken. We find that it is best to rebuild the buckets by welding. If this is not done there is considerable water thrust on the bearings which has a tendency to spring the shaft, making it necessary to replace the runners in course of a very short time.

Portland Railway, Light & Power Company—Possibly the question refers to impulse wheels. In case turbine wheels are referred to, we have no tests to show effect on efficiency and as a basis for changing wheels. Have experienced trouble with buckets of turbine wheels wasting away on back side in a number of instances. This is a serious trouble.

7. Have you had any wheels, nozzles or buckets replaced by other or improved design, and if so, what data have you on the betterment?

Oregon Power Company—This company is now contemplating the installation of new runners in the wheels referred to in the preceding question, with a more improved type. The manufacturers of the wheels have supplied us with data to show that the new runners will increase the capacity of the wheels 10 per cent at an expense of \$10 per horsepower for the increase.

Portland Railway, Light & Power Company—Wheels replaced gave trouble from breakage of turbine buckets. New wheels have no trouble.

8. Can you give data on other hydraulic economies of general interest?

Washington Water Power Company—There are four plants on the same river which is fed from a lake of about 45 square miles area with a controllable depth of about 6 feet. The plants are in the following order: Commencing from the lake, Post Falls, Spokane, Long Lake, and Little Falls. After the spring flood water is passed the controlling gates and bear trap dams at Post Falls are closed and as far as possible only sufficient water is passed through the Post Falls plant to enable the other plants to carry the proper load without losing any water over the dams. The problem is complicated by the time element of flow between the plants and by the necessity of furnishing sufficient water for operation of the city's pumping plant and the Inland Empire Railway Company's power plant. Water cannot be conserved at Long Lake, as that plant is only equipped for an output of 25% of its ultimate capacity.

Questions 4, 6 and 7 are not answered, as presumably they refer to impulse wheels, and we do not use any.

TRANSMISSION AND DISTRIBUTION ECONOMIES

1. What percentage of your total energy generated is sold to consumers?

Washington Water Power Company—78.1%, approximately.

Oregon Power Company—72%, approximately.

Portland Railway, Light & Power Company—76.3%, approximately.

2. Of the difference between the two, do you know how much is lost in your transmission system, and how much in your distribution system; that is, have you sum totals of metered energy passing through your distribution substations?

Washington Water Power Company—No information is given as to the differentiation between "Transmission" and "Distribution," but for the purpose of furnishing the information asked for the low voltage feeders from the power stations and substations in Spokane were considered "Distribution Lines," and all others were considered as "Transmission Lines."

The losses there are as follows, approximately:

In Transmission System, 59.3%.

In Distribution System, 40.7%.

Oregon Power Company—18 per cent in transmission system and 10 per cent in distribution system.

Portland Railway, Light & Power Company — Loss in transmission, 7.9%. Loss in distribution, including 600 volt railway and other conversions, 15.8%.

3. What steps have you taken to reduce transmission and distribution losses, and what results do you estimate from such steps?

Washington Water Power Company—As yet none. Owing to power plant over-development the losses have not been such as to justify any capital expenditure to reduce them. Considerable expenditure is now being made to improve regulation by increasing line conductivity and this will of necessity decrease the percentage loss.

Oregon Power Company—We have provided disconnecting switches so as to remove certain step-down and step-up transformers during the light load period, so as to overcome excessive transformer charging current. This will result in a reduction of 25% in transmission losses.

Portland Railway, Light & Power Company — We endeavor to maintain balance between economy and cost.

STEAM PLANT ECONOMIES

1. What number of kilowatt hours per barrel of fuel oil do you obtain from each or any of your steam plants, giving brief description of plant and load conditions?

Portland Railway, Light & Power Company—Plants under standby mostly. Burn sawmill refuse (hog fuel) principally. Fuel oil used only in emergency and have no data on fuel oil alone under running conditions.

2. Does it pay to test fuel oil when purchased for gravity, percentage of moisture and calorific value?

Oregon Power Company—Yes.

Portland Railway, Light & Power Company—We never have confined ourselves to test specifications.

3. Have you any definite data on the percentage of steam used in atomization of fuel oil?

Oregon Power Company—0.529 lbs. steam per lb. oil.

Portland Railway, Light & Power Company—No.

4. What has been your experience with heat insulation of boiler settings?

Oregon Power Company—Properly insulated boilers will effect saving of 20 per cent.

Portland Railway, Light & Power Company—Have had no trouble. We use ordinary settings.

5. Do you use economizers, and if so, what feed water temperatures do you get ingoing and outgoing?

Portland Railway, Light & Power Company—One plant

has economizers. Ingoing feed water, 164 deg. F. Outgoing, 240 deg. F.

6. Have you had any experience with automatic control of dampers, fuel oil supply, etc.? If so, with what results?

Oregon Power Company—This company has installed in its Springfield plant one Mason regulator which gives entire satisfaction.

Portland Railway, Light & Power Company—No.

7. Have you modified your furnaces to improve efficiency, and if so, with what results?

Oregon Power Company—We found from tests that it is best to have as large a space as possible between the grate bars in order to increase the draft area. This not only increases the capacity of the boilers, but it also helps to keep the grate bars cool. We also find that it is best to install hollow rest bars under the grate in the ovens, which allows a constant circulation of water through the rest bars. We also keep a constant supply of water in the ash pits. The condensation of this water has the effect of keeping the carbon deposit on the grates soft so that same can be removed easily when the clinkers are raked.

Portland Railway, Light & Power Company—Furnaces arranged to get best results using hog fuel regularly and fuel oil in emergency.

8. Have you any fuel oil burner that you consider superior in the matter of efficiency. If so, give data.

Oregon Power Company — Inside mixer burners such as the Hammel have given good efficiency in our Springfield generating station at Springfield, Oregon.

Portland Railway, Light & Power Company—The Hammel burner does very well under our conditions.

9. To what extent does it pay to equip your fireroom with indicating or curve-drawing instruments, such as draft gages, flow meters, pyrometers, temperature recorders CO₂ indicators, etc.?

Oregon Power Company — In modern power plants the installation of the above instruments is a necessity.

Portland Railway, Light & Power Company—It pays to the extent that the data shown by the instruments affects the practical and efficient operation of the plant. We favor most of the instruments enumerated for a plant which runs continuously during any period.

10. What is your opinion on steam versus electric auxiliaries, with special reference to heat balance, assuming the use of feed water heaters?

Oregon Power Company—We favor steam auxiliaries.

Portland Railway, Light & Power Company—Should use some steam auxiliaries with feed water heaters, but prefer electric drive for most of the auxiliaries.

11. How high a vacuum do you carry, and is this measured at the turbine discharge or at the vacuum pump suction?

Oregon Power Company—28-inch, measured at turbine discharge.

Portland Railway, Light & Power Company—Carry 29 inch, measured at turbine discharge.

12. Have you experimented with steam lanes, baffles, etc., in your condensers, and if so, with what results?

Portland Railway, Light & Power Company—No.

13. Have you any data on improvement of vacuum to be obtained by increasing your circulating water supply, and relative costs and benefits to be derived?

Oregon Power Company—This company has installed in its Springfield generating station at Springfield, Oregon, a Worthington 2½-inch two stage Hotwells pump for a condenser for a 2000 kw. General Electric turbine. An investigation into this matter shows that much better results can be obtained by the replacement of this apparatus with a Radojet Air Pump. This equipment would not only occupy much less floor space, but would be considerably more efficient.

14. What economies of fuel or increase of efficiency have you been able to obtain in your steam plants by other means than those mentioned above, giving particulars?

Oregon Power Company—Under ordinary conditions this company uses sawdust, planer shavings, slashwood and mill refuse in its Springfield generating station, and we find that by making the fuel distributing system over the boilers automatic and by feeding a certain supply of fuel constantly on the fire that much better results can be obtained. Before this automatic device was installed we would fill the ovens with fuel, and this practice was found to result in the decrease of the efficiency of the boilers until such time as the fuel would burn to the point where the maximum heat was obtainable. Under the arrangement now in effect the fuel is always at red heat.

Portland Railway, Light & Power Company—See answers to other questions.

NORTHWESTERN ELECTRIC COMPANY—ANNUAL OPERATING RATIOS

	1916	1917
Per cent—Transmission Line loss of delivered to line	8.68%	7.88%
Per cent—Pittcock generated of total generated and received	7.1 %	9.29%
Per cent—Station Light and Power of total generated and received	2.01%	2.22%
Per cent—Portland Stations, Tie Lines and Transformation losses of delivered to Portland stations	14.5 %	12.43%
Per cent—Distribution losses of delivered to Distribution System	4.7 %	4.32%
Per cent—Sold to Consumers of total generated and received	80.0 %	81.2 %
Per cent—Total Loss to System of total generated and received	20.00%	18.8 %
Per cent—Average generated at Condit Plant of its rated capacity	57.2 %	65.7 %

F. D. Nims explained that in utilizing powdered coal better results are obtained from the poorer grades. In using hogged fuel 400 kw. hr. are obtained per unit (200 cu. ft.) An ordinary sawmill produces about one unit per thousand feet of board cut.

L. M. Klauber, San Diego Consolidated Gas & Electric Company, described an automatic system for controlling hot oil flow which cost much less and is nearly as effective as more expensive installations. He advocated constant use of soot blowers and tube cleaners in boilers and an air and water cleaning spray in condenser tubes.

John R. Brownell of the California Industrial Accident Commission stated that the life of the boiler may be prolonged by water treatment instead of cutting the scale.

S. J. Lisberger described a simple device for determining the salt content of boiler water; a maximum of 50 gms. per cm. being allowed.

IRON AND STEEL CONDUCTORS

R. C. Powell's paper (p.338) was summarized by **S. J. Lisberger**, who pointed out that iron wire can economically be used for small loads, but that stranded cable has less reactance with heavier currents and can be used for guy wire in the future.

L. M. Klauber stated that the San Diego Consolidated Gas & Electric Company has built 300 miles of steel conductor line, using it to advantage (1) for long spans requiring high tensile strength, (2) lightly loaded main lines of moderate length, (3) for 2300, 6600 and 11,000 volt branch lines, (4) series circuits. He believes that those who have used it will not go back to copper, regardless of price, because the ratio of copper to steel prices will probably be the same. Much of the construction is with 700 ft. spans and 40 ft. poles with 4 ft. triangular clearances. Two poles are used for spans of over 1000 ft., no poles being placed in any stream bed, no matter how dry. Single galvanized steel cable corrodes, but extra galvanized has an indicated life of 15 years in salt air. A special device is employed for painting long spans every two years.

Standardization of Pin Type Insulators

Discussion of the committee report on "Standardization of Pin Type Insulators" (p. 333) was introduced with the following written communication:

J. P. Jollyman: The committee has recommended the use of the higher efficiency types of insulators for Class 4 and

Class 5 service after calling attention to the advantages of this type as compared with the older or standard types.

The higher efficiency type, while in many ways much better than the standard types, has two characteristics which are not as good. First, it has a lower striking distance. Second, it has a lower effective surface resistance. The lower striking distance gives the insulator a greater factor of safety against puncture and this may be a valuable characteristic in districts where lightning is frequent and where the older types are liable to puncture. In districts subject to heavy fogs or other conditions leading to the liability of flashover from excessive surface leakage, the shorter striking distance may be a disadvantage.

While the method of computing the true relative surface resistance of insulators has been generally known since it was given by Mr. A. O. Austin in his paper on suspension insulators in Proceedings A. I. E. E., Vol. 30, 1911, the manufacturers have never given this function in their catalogue data but continue to give "leakage distance," which is not a true basis of comparison.

Considering the two types of 27 kv. insulators illustrated in the report the following comparison will serve to illustrate the points mentioned:

	Standard	Higher Efficiency
1. Actual leakage distance of top from tie wire to cement joint, inches	5	5½
2. Actual leakage distance of center from cement joint to pin, inches	8½	6½
3. Per cent relative resistance of top, tie wire to cement joint	26.6	40.0
4. Per cent relative resistance of center cement joint to pin	73.4	60.0
5. Relative surface resistance of the two types, per cent	117.0	100.0

In items 4 and 5 the effective surface was considered as ending when the lower end of the petticoat next to the pin was reached in the higher efficiency type and when a point 1 inch from the pin thread was reached on the inside surface of the center of the standard type. The surfaces beyond those considered above are so close to the pin as to be ineffective under the conditions when surface leakage becomes important.

It must be conceded that the higher efficiency type will not lose effective leakage surface due to tilting on the pin, whereas the standard type may lose most of the surface on the inside of the center due to this trouble. Such a condition will reduce the effective surface resistance of the standard type to 86% of the surface resistance of the higher efficiency type.

Flashovers of insulators sometimes take place when conditions giving rise to excessive surface leakage occur. Heavy fogs, especially near the sea coast, and possibly the sudden formation of dew, give rise to surface conditions which permit high leakage, and this is sometimes followed by a flashover. Where such conditions occur a type of insulator having a high surface resistance and a long striking distance should give superior service. In bringing out their higher efficiency designs the manufacturers have improved their insulators in many ways, especially mechanically, but have not greatly improved their surface leakage characteristics. It is these characteristics that are most important where lightning is infrequent and surface conditions are bad.

It does not appear that the higher efficiency types of insulators are much, if any, better than some of the older types from the standpoint of their ability to resist flashover under favorable surface conditions.

P. M. Downing stated that no close relationship exists between standardization of line voltage and standardization of insulators. For example, a 60,000 volt insulator in some situations is not suited for 11,000 volts under other conditions. Catalogue classifications should be based on duty to be expected from an insulator under given climatic and operating conditions.

C. O. Poole, in response to a question by **S. J. Lisberger**, advised that the Southern Sierras Power Company has

place all 11 to 17 kv. types used for 6 to 8 kv. severe service on the coast.

The same objection as to ineffective surface insulation applies to the type recommended for 11,000 to 15,000 volts. coast service. These objections are met by a new insulator of more efficient design (Fig. 2) which should supersede the older type.

This proposed insulator has the same exterior dimensions as that recommended, thus allowing the use of the same pin length. Its thicker porcelain allows a higher flashing potential by its reduction in charging current. Its surfaces are arranged to take the proper proportion of voltage stresses under varying weather conditions. Its greater mechanical strength allows increased pole spacing.

Insulator manufacturers will gladly co-operate with the committee in putting these recommendations into effect and thus bring about a reduction of the number of types in use.

SUBSTITUTE FOR CEDAR POLES

The discussion of L. M. Klauber's paper on "Substitute for Cedar Poles" was opened by R. E. Cunningham of the Southern California Edison Company with the following paper:

As Mr. Klauber's paper leaves open the question of length of service to be obtained from Douglas fir, it is possible that some definite idea can be obtained from the report of the U. S. Department of Agriculture Forest Service on experiments with Western yellow pine. I understand that the Western yellow pine has much the same characteristics as Douglas fir.

In 1906 the Forest Service began a test on the treatment of poles, known as Project L-34. A large number of cedar and yellow pine poles were treated in an experimental plant installed at Wilmington, California, and these poles were set in regular line construction by a number of power and telephone companies, reporting back to the government date and location where poles were set. The following is a complete copy of the last progress report covering the experiment on yellow pine poles, which I believe is of special interest to us at this time. By the government's report it would appear that hot creosote open tank treatment will preserve the butts of the poles a reasonable length of time, but some method should be adopted for preserving the portion of the pole above ground.

"REPORT ON SPECIAL PINE POLES"

The Western pine poles installed in and near Los Angeles under this project comprised a special shipment of 81 35-foot poles cut at Pine Ridge, Madera County, California, in summer of 1906. They were to be used in trying out a new apparatus designed to treat only the butts under pressure. Upon trial this apparatus was found to be impracticable because it could not be made to prevent loss of preservative through season checks in the poles. Forty-eight of them were therefore given the ordinary open tank treatment with carbolineum.

After treatment the poles were distributed among the six co-operators in Los Angeles. Subsequently the U. S. Long Distance Telephone & Telegraph Company became a co-operator by taking over most of the experimental poles owned by the Home Telephone Company. Nearly all installations were made in 1907-1908, three being recorded as set in 1909.

A few of the poles were carried away by floods, one was broken in moving and twelve have since been removed because new construction required higher poles. The total number included in this report is fifty. The result of the inspection is as follows:

Condition of Butts, November, 1916			
Treatment—	Sound	Rotted Off	Total
Creosote, tank	25	0	25
Carbolineum, brush	0	11	11
Untreated	0	14	14

This table includes all of the carbolineum brush treated poles in the experiment, and all untreated poles for which

there were setting records, except such as were destroyed by floods.

The average life of the poles treated with carbolineum was five years and two months. This includes two which were set in concrete and which remained in service two years and four months longer than any of those similarly treated and set directly into the ground. With these two omitted, the average life was four years and five months.

The untreated poles gave an average service of three years and six months. This includes one set in concrete which remained in the line three years and two months longer than any untreated pole in the experiment set directly into the ground. Two others set in concrete lasted four years and eight months and five years. With these poles omitted, the average life was approximately three years.

Though all of the poles treated with creosote by the open tank method are sound below ground, i. e., in the portion treated, nine show serious decay in the tops. One untreated pole which was stubbed when rotted off shows serious top decay. One which failed before 1912 and which had been attacked by woodpeckers, was decayed below the nest. At least two of the untreated poles were attacked by insects below the ground line, decay being hastened considerably thereby.

Summary

Western yellow pine is not a satisfactory pole timber for use in the vicinity of Los Angeles.

- 1. Untreated Western yellow pine poles show an average life of about three years.
- 2. Such poles, given a brush treatment (2 coats) with carbolineum last about four years and five months.
- 3. Such poles given an open tank treatment with creosote show 100 per cent of butts sound in 8 3/4 to 9 1/4 years.
- 4. Of 28 such poles in service 8 2/3 to 9 3/4 years, eleven or 39.3 per cent show serious decay in the tops.
- 5. A brush treatment with carbolineum is not a satisfactory protection for such poles.
- 6. An open tank treatment with creosote has given perfect protection over a period of 8 3/4 to 9 3/4 years.

E. A. Quinn said that the San Joaquin Light & Power Corporation is using Port Orford cedar instead of treated poles. Tamarack pine poles, given an open tank butt treatment, and put in the ground in 1908 with 33 lbs. of creosote per pole, all had to be stubbed within five years.

C. O. Poole cited satisfactory results with lodge-pole pine poles treated in a temporary portable tank in 1908. Although no penetration was perceptible after 24 hours boiling, yet 600 poles thus treated lasted nine years.

S. J. Lisberger reported that the Pacific Gas & Electric Company is using concrete reinforcing stubs, as is likewise the Pacific Telephone & Telegraph Company. Stubbed poles that have been in service three or four years are still as good as ever. This affords material relief from the shortage of poles and reduces the cost of labor.

E. R. Northmore of the Los Angeles Gas & Electric Company has concluded that concreting old poles does not pay because the rot follows up to the top of the concrete. He prefers treated stubs.

L. M. Klauber believes that concrete stubbed poles which have been in service at San Diego for nine years are as strong as when first put in. There is no danger in this method if all the old rot is cut out and replaced by a 4 to 6 inch concrete collar with mesh reinforcing. At present prices of 30 cents a foot a new pole costs about \$50 to set in place, including labor, whereas \$7.50 will pay for reinforcing.

INSULATOR DETERIORATION

The report of the committee on insulator deterioration as presented by Mr. John A. Koontz, brought forth no important oral discussion. Several written contributions were received, as follows:

H. Michener: The experiences with suspension insulator depreciation on the lines now constituting the system of the Southern California Edison Company, are set forth in Table 1. The great majority of the defective insulators were found by the megger. These figures do not indicate any law

TABLE 1

DEPRECIATION OF SUSPENSION INSULATORS ON TRANSMISSION LINES

Results of Tests on Southern California Edison System. All Tests Made With Megger Except as Noted

Line—	Voltage in Kv.	Length of Line—Miles	Date Put Into Service	No. Units Tested	No. Units Defective..	Percent Defective..	Time Since Previous Test—Mos.	Percent De- preciation per 12 Mos.
Big Creek Line—150 kv.....	150	240	Nov., 1913					
Eagle Rock to Magunden.....		100	Nov., 1913					
1915 Tests—Only a few tested.								
1916 Tests—March				31,997	510	1.6	28	0.7
1917 Tests—								
West Line—Jan. to March.....				36,516	1,050	2.9	11	3.2
East Line—Feb. to April.....				36,357	1,388	3.8	12	3.8
West Line—Mi. 210 to 240—August				11,868	1,428	12.0	5	29.0
East Line—Mi. 210 to 240—August				11,556	907	7.9	5	19.0
Magunden to Toll House.....		121	Nov., 1913					
1915 Tests—September				15,896	79	0.5	22	0.27
1916 Tests—May				18,932	154	0.8	8	1.2
1917 Tests—May				44,807	534	1.2	12	1.2
1918 Tests—April				38,538	428	1.1	11	1.2
Toll House to Power House.....		19	Nov., 1913					
1915 Tests—								
West Line—September				9,541	568	5.9	22	3.2
East Line—September				10,350	618	6.0	22	3.3
1916 Tests—March				19,712	1,186	6.0	6	12.0
1917 Tests—								
West Line—April				9,932	147	1.5	13	1.4
East Line—April				11,192	110	1.0	13	0.9
Fernando Line from								
Eagle Rock to Fernando Road.....	15	5½	Nov., 1913					
1916 Tests—March				414	104	25	27	11.1
1917 Tests—December				433	42	9.7	10	11.6
Line No. 3	15	7	Nov., 1913					
1916 Tests—August				666	10	1.5	33	0.5
Line No. 4	15	11½	March, 1914					
1916 Tests—May				970	64	6.6	25	3.2
Newport Beach Line.....	15	35.8	Feb., 1914					
1916 Tests—April				363	101	27.8	28	12.0
Vernon to Redondo	60	18¼	July, 1914					
1916 Tests—March				1,092	143	13.1	21	7.5
1917 Tests—December				7,159	380	5.3	21	3.0
Line No. 2	60	15½	Nov., 1913					
1915 Tests—May				6,145	537	8.7	18	5.8
1916 Tests—December				6,145	599	9.8	19	6.2
1917 Tests—December				6,145	216	3.5	12	3.5
Borel Line—								
Eagle Rock to San Fernando Road.....	50	5½	Nov., 1913					
1915 Tests—February				1,875	414	22.0	27	9.8
1917 Tests—November				1,107	129	11.6	21	6.7
Line No. 10	60	50¼	August, 1913					
1915 Tests—October				11,863	627	5.3	26	2.4
1916 Tests—January				11,863	103	0.9	3	3.5
1917 Tests—February				13,182	1,796	13.6	13	12.6
San Bernardino to Pedley	15	21.8	July, 1914					
1915 Tests—April				6,651	366	5.5	9	7.3
1916 and 1917 Tests—								
August, 1916, to March, 1917....				6,651	1,508	22.7	19	14.3
Fernando to Saticoy.....	60	48	Oct., 1915					
1917 Tests—December				10,164	460	4.5	26	2.1
L. A. to Newmark	60	5½	Dec., 1912					
1916 Tests—Dead Ends Only—April.				1,260	90	7.1	40	2.1
Dead Ends Only—Oct....				1,350	118	8.7	7	12.5
Suspension—October				1,342	23	1.7	47	0.4
Newmark to Chino.....	60	26	Dec., 1912					
1917 Tests—January				7,242	679	9.4	48	2.4
Chino to Colton.....	60	22	Dec., 1912					
1917 Tests—January				6,742	726	10.8	48	2.7
Long Beach to Newmark.....	60	20	1912					
1916 Tests—November				5,610	440	7.8	48	2.0
Long Beach to Katella.....	60	21	May, 1914					
1916 Tests—September				7,594	616	8.1	28	3.5
1917 Tests—May				7,594	305	4.0	8	6.0
1918 Tests—January				7,594	848	11.2	8	16.8
Katella to Fullerton	60	5	1916					
1917 Tests—April				3,662	64	1.7	12	1.7
1918 Tests—January				3,662	31	0.85	9	1.1
MacNeil to Sherman.....	30	7½	1914					
1917 Tests—May				1,202	75	6.2	36	2.1
Kern River Lines.....	60							
L. A. 3 to Fernando.....							about	
1917 Tests—September				6,729	467	7.0	3 yrs	2.3
Power House south—							2 and	
1918 Tests—April				7,720	14	0.2	3 yrs	0.1

NOTES: 1. These insulators were on the first 53 poles on the Redondo end of the line.

2. These tests were made with the oscillator.

3. This test report shows 5,113 insulators tested, with the notation that all insulators were not tested on account of new type all being good. The original insulators were those designated as type "A," and the new type, which were placed after the December, 1916, test, are type "B."

4. This test consisted of megger, oscillator, and high potential tests on all units of this line. Previous to this test, the insulation consisted of three type "A" units in suspension and four type "A" units in dead end strings, and the line voltage was 15 kv. The operating records show that 2.1 per cent of these units failed on line trouble during the two to two and a half years of operation. After this test the first 12 miles out of San Bernardino was insulated with four type "B" units in suspension, and five type "B" units in dead end strings. The remainder of the line was insulated with four and five type "A" units which had passed the test.

5. See Table 2 for details of this test.

6. In contradiction to the apparent good performance of these insulators, judging from this megger test, it should be stated that seven insulator breakdowns occurred (18 units broken) on this section of line during the first three months of this year. This meggering was carefully done, even to the extent of overhauling the megger and then remeggering a whole day's work as a check. The insulation consists of four units in suspension and five units in dead end strings. The voltage varies from 75 kv. to about 70 kv. over this section of the line.

of depreciation. This may be because there is no such law, or because the megger is not a reliable instrument for picking out the defective insulators.

Of the insulators tabulated in Table 1, the approximately 185,000 located on the first eleven lines listed can be designated as type "A." These insulators are of the single piece, 10-inch diameter type, having pin and clevis hardware, grooved

head and pin hole, cement entirely surrounding the head and upper end of pin, and no gasket to prevent lower edge of cap from bearing on the porcelain.

The approximately 50,000 insulators, located on the remaining eight lines listed, are all of the single piece, 10-inch diameter type, but the distribution of those having different detail characteristics is not known by the writer.

TABLE 2

RESULTS OF TESTS AND INSPECTION OF 10,450 TYPE "A" INSULATORS REMOVED FROM FERNANDO-SATICOY LINE
Removed November, 1917 — Tested December, 1917

	Kind of Test				Rejected by all Electrical Tests	Total Rejected
	Visual Inspection	Megger	Oscillator	High Potential		
Number units tested	10,450	10,164	6,644	9,842		
Number units rejected	286	130	169	161	460	746
Percent rejected	2.7	1.3	2.5	1.7	4.5	7.1

NOTE: Those rejected by visual inspection had been broken in handling.

TABLE 3

RESULTS OF HANDLING INSULATORS

10,450 Insulators Removed from Fernando-Saticoy Line and Shipped to Los Angeles — Tests Showed the Following Results

	Number Shipped.....	Number Broken when Received	Percent Broken when Received	Number Given All Three Elec'l Tests...	Number Rejected by Electrical Tests.....	Percent Rejected by Electrical Tests
Shipped crated	9019	205	2.3	5997	301	5.2
Shipped uncrated	1431	81	5.7	911	59	6.5

TABLE 4

COMPARATIVE DEPRECIATION OF DEAD END AND SUSPENSION INSULATORS ON SOUTHERN CALIFORNIA EDISON SYSTEM

Line—	Number Units Tested	Number Units Defective	Percent Defective	Percent Depreciation in 12 Months	
				Dead End	Suspension
Big Creek Line—					
Eagle Rock to Magunden:					
1916 Tests—Dead End	19,878	293	1.5	0.6	
Suspension	12,119	217	1.8		0.8
1917 Tests—					
East Line—Dead End	19,800	893	4.5	4.5	
Suspension	16,557	495	3.0		3.0
West Line—Dead End	19,800	650	3.3	3.6	
Suspension	16,716	400	2.3		2.6
L. A. 3 to Newmark—					
1916 Tests—April:					
Dead Ends	1,260	90	7.1	2.1	
1916 Tests—October:					
Dead Ends	1,350	118	8.7	12.5	
Suspension	1,342	23	1.7		0.4
Borel Line—					
Eagle Rock to San Fernando Road:					
1916 Tests—Dead End	750	194	25.9	11.5	
Suspension	1,125	220	19.6		8.7
Line No. 2—					
1915 Tests—Dead End	724	172	23.8	15.9	
Suspension	3,146	132	4.2		2.8

TABLE 5

INSULATOR FAILURES WHILE IN SERVICE—SOUTHERN CALIFORNIA EDISON SYSTEM

	Dead End		Suspension		Approximate No. of Insulators on Lines Reported
	No. of Failures	No. Units Destroyed	No. of Failures	No. Units Destroyed	
During 1917	40	52	16	23	200,000
First 3 months of 1918	12	24	13	31	300,000

The insulator referred to as type "B" is similar to the type "A," with the following exceptions: The cement that holds the cap extends only a short distance up the side of the head of the porcelain; the lower edge of the cap is separated from the porcelain by a gasket; and the cement does not extend across the upper end of the pin.

Table 2 shows the results of megger, oscillator and high potential tests on 10,000 type "A" insulators removed from the Fernando-Saticoy line. As a means of getting the best possible service from this line, all these insulators were removed and replaced by type "B" insulators. This case is cited primarily to show the loss which may occur from handling. Part of these insulators were crated in the standard shipping crates before being shipped to the testing yard in Los Angeles. The remainder were hauled in trucks in strings of three or six units without being crated. Table 3 shows the comparative results of these two methods of handling the insulators.

Table 4 shows some comparisons of the depreciation of dead end insulators and of suspension insulators.

The foregoing has dealt with insulator depreciation as indicated by tests. Table 5 shows the insulator failures which have occurred on this system during the past 15 months. These figures would be much more illuminating if the respective numbers of the dead end and the suspension insulators in service could be given. However, they do show that the greater number of failures occur on dead end insulators. But it must be borne in mind that at least part of this difference between the number of failures occurring on dead end insulators and on suspension insulators is due to the grounding of the insulator hardware on dead end insulators.

This company has now arranged to make much more complete reports of the insulator tests and insulator failures, with the hope that the information thus gained will be of some benefit.

H. S. Perkins: Insulator depreciation due to rapid changes of temperature can be lessened by using thicker porcelain than is found in the ordinary type of suspension insulator and by employing a white glaze. Thick porcelain gives greater dielectric strength, higher corona break-down point and retarded temperature rise in interior parts of the insulator. The white glaze reflects the heat rays and particularly prevents their absorption by the insulator. Experiments with black, brown and gray glazes definitely prove that the gray glaze absorbs heat more slowly, and consequently the insulator is subjected to less rapid changes in temperature. It may also be beneficial to paint the hardware with aluminum paint.

Geo. M. Wills: When the insulator testing work of the Southern Sierras Power Company was started a year ago it was without precedent or past experience of other companies to follow. Being equipped with a 110 or 120 kv. 60 cycle transformer and a 110 to 125 kv. 200,000 cycles oscillator, it was first decided to give each insulator unit a 30-second test with the 60 cycles flashover and 15-second test with flashover voltage from the oscillator.

It was soon found that most of the bad units were discovered soon after the application of the stress and that a continued application of flashover voltage caused units to break down that apparently had some insulating value left in them. It was finally decided to discontinue the use of the 60 cycle voltage and to establish a routine test of 5 seconds application of the flashover voltage from the oscillator. This test will locate a very large percentage of the bad ones with an expenditure of a minimum amount of time.

We have observed that our regular suspension type insulators with a 10-inch disc require a voltage of about 80,000 to flash over.

From the records made while testing at the steam plant with both 60 cycles and oscillator we find that while testing with the oscillator first we examined 716 units, of which 187

bad units, or 26 per cent, were found with oscillator, after which 113 more bad units, or 15 per cent, were found with the 60 cycle test. While testing with 60 cycle first we examined 897 units, of which 361 units, or 37.8 per cent, were found to be bad, after which 123 more bad units, or 12.8 per cent, were found with the oscillator test. While this would indicate that the 60 cycle test was more effective, it must be borne in mind that the 60 cycle test was for a period of 30 seconds and the oscillator for only 15 seconds. Later, while in the neighborhood of control station, we examined 198 units first with 5 seconds 60 cycle test, finding 1 bad one, after which a 5-second oscillator test was applied to the same units, finding 24 bad ones, or 12 per cent. This result is quite different from the results obtained at the steam plant.

Again, while at the steam plant, we examined 983 units with the H. T. megger, finding 80 units, or 8 per cent to be bad. When these units were subjected to a combined test of the 60 cycles and oscillator, we found 48 per cent to be bad. Later, while at Inyokern we tested 357 units first with the megger, after which they were given the regular 5-second oscillator test. The megger showed them all to be good, but the oscillator found 206, or 57 per cent, to be bad. This result illustrates how inadequate the megger is for insulator testing. The insulators at the steam plant probably had sufficient moisture in them to permit the megger to give a reading, while the bad ones at Inyokern were so dry after a hot summer that they all measured "infinity."

To date we have examined a total of 47,989 units from the line, of which 12,439 units, or 26 per cent, have been found to be bad. So far the insulators have been found to be in the worst condition in the neighborhood of Inyokern, where we tested 471 units, of which 243, or 51 per cent, were bad. The insulators which have been in the best condition have come from the neighborhood of control station, from which in one week, we tested 1730 units, of which 158, or 9 per cent, were bad.

We have made observations to determine whether insulators coming from one arm were in any worse condition than those coming from another. The results obtained were as follows:

	No. Tested	No. Bad	% Bad
Top arm	242	42	17%
Middle arm	228	42	18%
Bottom arm	233	43	18%

The results were so close that they may safely be called alike from all arms.

We have also reviewed our records to determine if the position of the unit in the string had anything to do with its being bad. From the records of nearly 6000 bad ones, we have the following:

	No. Bad	% of Total
No. 1 (nearest arm)	863	14.8
No. 2	972	16.6
No. 3	1015	17.3
No. 4	971	16.6
No. 5	979	16.7
No. 6 (nearest conductor)	1034	17.7

Again we have observed that there is very little difference between dead-end and suspension towers as far as bad insulators are concerned. This is shown by the following:

—Suspension Towers—			—Dead End Towers—		
Tested	Bad	% Bad	Tested	Bad	% Bad
2407	520	21%	2417	453	18.7%

We have found that a great majority of the insulators fail through cracks in the head of the unit, break-downs occurring between the end of the pin and the inside of the iron cap. Only about 5 per cent of the failures have occurred through punctures outside of the iron cap. Most of these failures have occurred through original defects in the porcelain.

We have not found that failures have occurred any more frequently among insulators of dark than of light color, color being an indication of the extent of firing.

N. E. L. A. COMMERCIAL SESSION DISCUSSION

(The success of the California Co-operative Campaign, as recorded in the report of progress given at the meetings of the Commercial Section at the Del Monte conventions, was one of the most inspiring records of the gathering. The report of these sessions is here continued from the May 15th issue of the Journal of Electricity.—The Editor.)

ADDITIONAL DISCUSSION ON RETAIL SELLING PRACTICE

George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.: There is another form of advertising open to the small dealer through which the small dealer is playing an important part in the development of the electric business.

The small dealer can best advertise (and relatively at no expense) by making a house to house canvass of the territory in his district. This has particular reference to the small dealer in a town or in the outlying parts of a city. With a small stock of electric irons, he can leave one on a Friday or a Saturday for a few days over the ironing period. Likewise, a vacuum cleaner or toaster may be left; if the party has one or the other. We sometimes think that the market is saturated with these appliances. Nevertheless it is surprising how many homes are without these conveniences; conveniences which have become necessities. Where a sale is not made or a party is supplied, the dealer leaves his business card. The call gives a splendid opportunity for him to introduce himself and makes it easy for the householder to call at the place of business to make a purchase. When lamps, fuses, bell batteries, the come-back trade of the electric business, are wanted, this party has the neighborly feeling which is natural and remembers him, especially when it is known that the same prices may be had as down-town. The small dealer can do the soliciting at odd times. If the dealer is large enough to have a clerk or handy man, it is good training to give him an opportunity to solicit. Personal contact with the people of the neighborhood is direct advertising.

PROBLEMS OF THE CONTRACTOR-DEALER

W. S. Berry, Western Electric Company, opened the discussion on J. M. Carlson's paper (p. 421) by stating that a careful investigation of a man's character and record is made by the jobbers before extending credit to him as a new contractor-dealer.

F. J. Somers of San Jose spoke for square treatment of customers by dealers.

D. E. Harris, Pacific States Electric Company, explained that credit is being extended to men who deserve it and that such men are encouraged to enter the business of electrical contracting and retailing in districts where the public is not now adequately and honestly served.

"BRICKS WITHOUT STRAW"

G. B. McLean abstracted the committee report entitled "Bricks Without Straw," laying particular stress upon the committee recommendation that selling data as published be codified, catalogued and indexed. After an extended discussion such action was cared for in a resolution submitted to the convention and subsequently passed.

ORGANIZATION OF THE INDUSTRY

T. E. Bibbins summarized his paper on "Needed: A Community of Interest," stating that the spirit of the convention already pointed to the fact that his message has been taken to heart.

Lee H. Newbert, as an example of actual co-ordination of effort, traced the development and accomplishment of the plan of the California Co-operative Electrical Selling Campaign. He believes that two years of work will bring forth most gratifying results to all participants. The complete report appears at the end of this discussion.

H. F. Jackson and R. H. Ballard participated in a discussion which finally led to framing a resolution extending the time of the campaign to June 30, 1919, this resolution being later adopted.

R. H. Ballard remarked that the proceedings of the convention had indicated the absolute necessity for co-operation of the electrical industry as a whole. He also developed the fact that in order that the fuel oil shortage may be met by the building of new hydro-electric plants, money must be raised not only through the government but from the public, especially consumers and employees. The success of such financing is dependent upon the public's realizing that the development and expansion of power companies is a war necessity.

Samuel Kahn pointed out that united action on the part of every branch of the industry is needed to meet the problems of finance and labor which now face us.

H. N. Sessions suggested the need for co-operation from and with the architect. The N. E. L. A. can be of such value to him as to warrant his joining, and the architect can be of such value to the N. E. L. A. as to warrant his being invited to participate in meetings.

C. F. Butte thought that Mr. Bibbins' paper might be better entitled: "Needed: A Community Ethically Educated." He suggested that every electrical activity should be put to the test "Is it ethical?" He questioned the ethics of charging operating expenses of a municipally owned utility to some other municipal department, of forbidding jitneys to parallel a municipal railway and allowing them to parallel a privately owned system, of a power company paralleling the sales effort of a dealer and charging the sales expense to another department, of a wholesaler doing a retailing business, or of a manufacturer competing with his wholesaler.

W. L. Goodwin then presented an explanation of his plan for national organization of the electrical industry, as has already been described in these columns.

REPORT OF PROGRESS ON CALIFORNIA CO-OPERATIVE ELECTRICAL SELLING CAMPAIGN

BY LEE H. NEWBERT

The committee is working to secure a suitable trade mark for the California Association of Electrical Contractors and Dealers. As soon as this trade mark is secured and adopted by the Contractors' Association, the newspaper space of the various central stations that has been offered to the campaign committee will be utilized to place the monogram, and the objects of quality service behind it, before the public throughout the state.

Mr. Newbert mentioned the objects of the campaign, particularly calling attention to that object of the campaign which the committee feels must be accomplished before much other work can be carried on successfully. This object is the bringing into closer relations and understanding the various individuals and companies in the industry, as mentioned in the commercial committee report published in the Journal of Electricity (page 423), and which has been published elsewhere in connection with the outline of the campaign work.

The report of the field man for the southern section of California which was presented to the Advisory Committee on May 8th, shows that the campaign work is bringing excellent results along this line. Mr. Newbert abstracted this report for the commercial session, emphasizing the following points:

The field man started in the southern section of the state about the last week in January, and dealers and central stations in all towns and cities except Los Angeles were called upon and acquainted in detail with the campaign. The field man secured on this trip information as to the exact conditions prevailing in all parts of the territory. A report of this work was given to the Advisory Committee at Fresno on February 28. At this meeting it was decided to hold a general get-together meeting at Los Angeles on March 15.

The field man spent the first two weeks in March in making arrangements, creating interest and securing attendance for this meeting. All the central stations, jobbers, manufacturers and principal dealers in Los Angeles were called upon, advised in detail of the meeting and impressed with its importance. The result was that the meeting was attended by two hundred and eighty of the leading electrical men in the southern section of the state, including central station officials, and contractors and dealers from one end of the territory to the other; the jobbers and manufacturers almost to a man.

The field men have found that the meeting has given valuable assistance to their efforts and recommend that in the future, at intervals of about six months, similar meetings should be held. There are specific cases where it has been reported by dealers that an appreciably improved co-operation on the part of the central station district agents has resulted from this meeting.

Since March 15th the field man has covered Los Angeles thoroughly and put forth a great deal of effort to increase the membership of the California Association of Electrical Contractors and Dealers in that section. The membership of the southern section of the Association before the drive started was 43. It is now 65, and there are still prospects whose applications will be secured. This work has not only strengthened the Contractor-Dealer organization, a move necessary for the campaign's greater success, but has developed their appreciation of the campaign's efforts to help them and this is demonstrated by their closer co-operation with the campaign.

The campaign has brought about a closer co-operation between all branches of the industry in southern California than there has ever been before. Everyone is beginning to realize that the electrical business is continually becoming a better business and that the campaign will do much to assist it in going forward with more rapid strides in the future than it has in the past. While the co-operation between the central station and contractor-dealers has improved since the start of the campaign, it is still far from what it should be. In covering the territory much effort has been put forth to correct wrong impressions and opinions that some of the dealers have had of central stations; cases were found where the dealer was of the opinion that the central station was doing things which either had not been their practice for months or even never had been done. The dealer in some cases had taken the word of his customer and had not taken the trouble to find out whether or not it was correct. One dealer had reduced his prices to meet those which his customers had told him the central station was charging.

It was proven to this dealer that the central station had not made the prices claimed by the customers but was selling everything at regular list prices. Some dealers have blamed the central station and some central station men have blamed the dealers for doing certain things which each were justified in doing. When the position of the one is explained to the other an entirely different attitude usually results and many such cases have been cleared up since the start of the campaign. Both the dealers and the central stations are equally responsible for the conditions that have existed. There is but one solution to this problem and that is the dealers and the central station men must become better acquainted. To see that this is done is, in the committee's opinion, the most important work of the field men.

In covering the territory many suggestions in merchandising have been offered to the dealers by the field men, quite a number of which have been put into practice. Assistance has been given to the dealers in laying out their new stores and there are several dealers now looking for better locations, who, when these locations are secured, will call on us for suggestions. Also suggestions for re-arrangement of other stores have been offered. There is no limit to the amount of valuable assistance than can be rendered along these lines.

The committee handling the campaign feels very much encouraged over the results obtained to date and believe that those secured in the future will be far more encouraging. The southern section of California has now been thoroughly covered by the field man, every one is familiar with the campaign and its objects and we have reports showing the actual conditions existing in all parts of the territory. The future efforts of the field men in our committee should show very noticeable results.

Because the field man for the northern section of the state was secured nearly two months later than the man for the southern section, the work in the northern section has not progressed so far, but it is making progress along the same lines and on the same plan used in the south. The committee expects to soon be able to report equally satisfactory progress.

Our principal efforts from now on until satisfactory conditions are established will be to create more friendly relations between central station employees and contractor-dealers, as well as assisting contractor-dealers in merchandising. The condition that we have to overcome is not usually one of unfriendliness between central stations and contractor-dealers, but rather one of indifference. The men in one branch of the industry do not seem to understand that their success is dependent upon the success of all other branches, and that in all their plans they should take into account how these plans will affect companies and individuals in the other branches.

On account of the success of the get-together meeting in Los Angeles, a similar meeting has been planned by the committee to be held in San Francisco on Friday evening, June 7. At this meeting it is hoped that all representatives and employees of central stations and of contractor-dealers, jobbers, manufacturers and engineers, will attend. The committee promises a most interesting meeting.

WOMEN IN THE INDUSTRY

(The number of women employed in industry is increasing at a greater rate than the provisions made for their absorption. A new man employee is carefully instructed and broken in to the spirit of the organization he is to serve. Until we make similar provision for our women employees we are not giving them an equal chance to develop into the ideal worker which we are seeking. This inspiring record of what has been done along this line by a Southern California public utility company was one of the features of the Women's War Service Session of the recent Del Monte conventions. The author, as secretary to the president of the Southern California Edison Company, has had much to do with the development of the fine spirit of the women of her organization.—The Editor.)

WOMEN AND PUBLIC UTILITY EFFICIENCY

BY GERTRUDE TUCKER

A year ago there were barely fifty women in the Southern California Edison Company's service, and since that time, on account of the consolidation of the Pacific Light & Power Corporation and the draft, this number has been increased to two hundred and fifty. If the number of men under arms is multiplied by five or seven, as it seems must be, the result will be the increase of women employees in the same ratio.

After all, what are the limitations of the work of women in public utilities such as are represented at this meeting? In my own company, it has been thought heretofore that women were useful as stenographers, secretaries, telephone operators and in work of similar character, but beyond such work women were not to be considered. Today's conditions have entirely changed these opinions. As a matter of fact, with few exceptions, women can handle almost any class of work heretofore handled by men in the clerical force of the various offices, as contract clerks, cashiers, bookkeepers, collectors, sales clerks and even women meter readers are being seriously considered by some companies. It is not expected at the present time that women will work into the technical departments of the company, but there are possibilities for women of the future to take up engineering courses which will make their services valuable to corporations like ours.

If there are to be so many women employed in public utility companies in the future, then it certainly behooves companies employing them not only to make them comfortable, to care for their daily needs while attending to their duties, but also to plan for their education so that they may be better fitted to fill the positions which in the future women must fill. I have heard it said that the average woman in the office is not as good as the average man, because it is said she has not the ability to concentrate upon her work. If there is any shadow of truth in such a statement, it is because the women who are employed in offices have not had the incentive and education to qualify for the work they are expected to do.

Did you ever stop to think how much the average woman office assistant works in the dark? It is "Miss Jones, take a letter, please." "Will you get me such a letter from the file?" "What is Mr. Blank's telephone number?" with scarcely a word of explanation about the work of her own department and nothing at

all of other departments. If it were not for her quick perception and intuition, she would be a total failure.

The men have had their district agents' meetings for the discussion of all phases of the company's business, and under the sponsorship of the National Electric Light Association, courses of education for salesmen, accountants, etc., but no one seemed to think of including the women in these, no doubt because of the small ratio of the women to the men.

In the Edison Company the men holding responsible positions, and those in training for such positions, have been persistently and constantly educated for many years past, and it is this education in all the niceties of the operation of the company's business and handling of its customers, that is responsible for what we call the Edison Spirit and the high standard of the company's employees. Now, if it has taken years to bring the men to the positions they have attained, how could it be expected that women could attain such proficiency and efficiency in a few months time, and if the women receive only half the training these men have received, they will be equal to filling any positions in which they may be placed.

I wonder if it is significant that the idea for the company's work among women employees grew out of a criticism of the personal appearance of some of the newer women employees. In defense, the statement was made that it was doubtless because they did not appreciate the dignity of working for a corporation of the high ideals ours possesses, and it was realized that in the confusion and busyness of consolidating two large organizations and working the women into the men's places, no one had taken the time to talk to them about Edison Spirit, about the company's history, what it stood for, and to explain to them the relation of their work to the work of the whole organization.

It is apparent to thinking women that there are certain descriptions of apparel which are suitable for the office, and other kinds suitable for the home, the theatre or elsewhere, and woman's usefulness may be increased if she is dressed in a manner suitable for her work. One woman of experience has given this advice to women in business: "Wear your best tailored clothes in the office instead of saving them for Sundays at home. You must impress your world, which is where you work, by your ability and success, and your clothes express you."

To meet the conditions in our company, a plan

was made for a series of meetings for women of the company, to give them an opportunity of becoming acquainted, and to learn and appreciate how much the company depends upon their loyal services. The first of these occasions was a luncheon, attended by 150 women, those of the general office and nearby districts, and by the company's officials, all of whom gave short talks. Mr. John B. Miller spoke on Edison Spirit and showed that it was a very real factor in the company's success. Mr. Brackenridge emphasized the interest of the company in the welfare of its women; Mr. Ballard spoke on cordial relations between officials and employees; Mr. Kemp told of the wonderful work of the women of Europe in sustaining the industries of their countries, and Mr. Kennedy explained the plan in detail, introducing the chief speaker of the afternoon, Mrs. Bertha A. Rich, a business woman who has gained success in two professions—advertising and magazine writing. Mrs. Rich's talk was an inspiration and an incentive to ambition, and as her hobby is personal appearance, she made some very telling points which were not lost on her audience, and the results of which were soon evident.

That was the first meeting. The general plan is to follow a kilowatt from its generation to its use by the consumer, and at the next meeting General Superintendent Pearson constructed upon the platform a working model of an hydro-electric plant, from the forebay to the lights on the poles. When the water was turned into the forebay, the wheels revolved and the lights shone. He explained in a simple, non-technical way the laws which govern the operation of the universe and showed by charts and demonstrations their application to the generation of electricity.

The next meeting came in the midst of the Liberty Loan Campaign and was on the subject of finance. Mr. Kemp, the comptroller, explained how money is raised to carry on the company's business, the different classes of stocks, bonds, etc., and how the money is spent. The assistant comptroller gave a most interesting resume of the chief events of the company's history, the development of its business, and its share in the development of Southern California.

Another very successful factor in bringing the women of the company together and teaching them to work as a unit, is the work of the Edison Auxiliary of the American Red Cross. Meetings are held twice a week for making surgical dressings, and an almost incredible number of these have been made. Knitted work is done in odd moments. The average is fifty garments a month, not a poor record for busy women who must do their patriotic work after eight hours in the office. In training the women to take the place of the men, we try to impress them with the fact that they are performing just as patriotic service as in the regular branches of war work.

We have material in our own organization for a very interesting series of talks, and it is my hope that the idea may be adopted by other companies in the Association, and that arrangement may be made for co-operation along the line of extending to the women associated with the public utilities every opportunity for gaining a complete knowledge and understanding of all phases of the work of the companies.

It certainly looks as if in these latter days, woman is coming into her own, but she cannot come into her full inheritance unless something is done to help her, and the individuals, companies and corporations using her services must do their share to train and educate the women associated with them. The women themselves must help each other, so they may be imbued with the right kind of ambition and incentive to self-improvement and inward desire to acquire the knowledge and information which will make them more useful and loyal to their employers and to themselves. Woman's possibilities today are greater than ever before in the history of the world.

"They speak about a woman's sphere
As though it had a limit.
There's not a place in earth or heaven,
There's not a task to mankind given,
There's not a blessing or a woe,
There's not a whisper, yes or no,
There's not a life, or death or birth,
There's not a featherweight of worth,
Without a woman in it."

STANDARDS FOR WOMEN WORKERS

The Woman's Committee of the Council of National Defense has recently adopted as its standards for women in industry those issued by the Ordnance Department of the Army. The "ordnance standards," as given in a Summary of Recommendations to Arsenal Commanders and Other Employers, provide:

1. **Hours of labor.**—Existing legal standards should be rigidly maintained, and even where the law permits a 9 or 10 hour day, efforts should be made to restrict the work of women to 8 hours.
2. **Prohibition of night work.**—The employment of women on night shifts should be avoided as a necessary protection, morally and physically.
3. **Rest periods.**—No woman should be employed for a longer period than four and a half hours without a break for a meal, and a recess of 10 minutes should be allowed in the middle of each working period.
4. **Time for meals.**—At least 30 minutes should be allowed for a meal, and this time should be lengthened to 45 minutes or an hour if working day exceeds 8 hours.
5. **Place for meals.**—Meals should not be eaten in the workrooms.
6. **Saturday half holidays.**—The Saturday half holiday should be considered an absolute essential for women under all conditions.
7. **Seats.**—For women who sit at their work, seats with backs should be provided, unless the occupation renders this impossible. For women who stand at work, seats should be available and their use permitted at regular intervals.
8. **Lifting weights.**—No woman should be required to lift repeatedly more than 25 pounds in any single load.
9. **Replacement of men by women.**—When it is necessary to employ women on work hitherto done by men, care should be taken to make sure that the task is adapted to the strength of women. The standards of wages hitherto prevailing for men in the process should not be lowered where women render equivalent service. The hours of women engaged in such processes should, of course, not be longer than those formerly worked by men.
10. **Tenement-house work.**—No work shall be given out to be done in rooms used for living purposes or in rooms directly connected with living rooms.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The problem of fixing the value of a water right is one of the most perplexed which confronts the valuation expert. Extremely varied opinions have been expressed by engineers and courts—indeed, there has been very little clear thinking on the subject. The following article, therefore, which is one of a series considering the water right from a logical standpoint, is not only of extreme interest but of great timely value. The author is well known as an engineer and valuation expert.—The Editor.)

IS THE VALUE OF A WATER RIGHT ASCERTAINABLE BY COMPARISON

When water is used for irrigation it makes the intense cultivation of the soil possible. It aids, as stated in the preceding article, in producing crops which can be marketed at prices not subject to regulation except by the law of supply and demand. The availability and use of the irrigation water modify the character and increase the amount and consequently the value of the crop. These elements may thus add an increment of value to the irrigated land. Under such use, the value of the water at the field and, upon allowance for the cost of development, its value at its source can be determined. Water and water rights in districts where water is used for irrigation acquire, in consequence, a recognized market value, depending upon the resulting appreciation of the land, upon the value of the crops harvested in relation to the cost of production, and upon the cost of developing and making available the irrigation water.

When water is taken from a stream for uses which decrease or otherwise modify the natural flow of the stream or when works are constructed which raise or lower the water plane of the stream the rights of riparian owners may thereby be affected. Contemplated diversion can not be made nor can proposed works be constructed in such cases, without making compensation to the riparian owners for the resulting damage to their property, except of course when such owners sleep upon their rights.

To the extent of the cost of extinguishing the riparian rights and possibly of securing other water rights whose use is secondary or which for any reason should be merged in one holding, there is then—a public utility being under consideration—an investment to be assumed in that intangible element—the water right.

Sometimes by reason of local development and high values of riparian lands and the use of the stream flow for power, the cost of settling with the riparian owners and of eliminating adverse users of the water may be large. At other times the situation is such that equally good rights to use water can be secured without any cost except the cost incident to the construction of the project features and the acquisition of the necessary lands and rights of way.

The fact that in the first case it will have to be conceded that the owner of the public utility is entitled to have the cost of the water right which he holds made a part of the rate-base and that at least to the extent of cost (reasonable and actual proper cost being assumed) this water right has or should be made to have value, justifies the public in concluding that the other water right which has cost nothing should have a similar value whether the same be made a part of the rate-base or not. Water rights applying to water

whose use is demanded by society, are then to be regarded as having market value. When the water is developed and is in use or is available for use or when the need of putting the water to beneficial use is proximate, the existence of such value is easily recognized. When an investment has been necessary to eliminate adverse rights and to meet other expense of securing the water right, the propriety of including its cost in the rate-base is unquestioned.

According to the decision of the U. S. Supreme Court in the case of San Joaquin and Kings River Canal and Irrigation Company v. the County of Stanislaus, California, the water right must receive the same consideration as other property when rates are to be fixed. But the court does not attempt to settle the question of how a water right is to be valued.

The right to appropriate flowing water and to put the same to beneficial use is given by law, in most of the Western states, to any one who will construct proper works for the development of the water and for its transmission to places of use. The water of the stream is reserved to the public. The grant of the right to take water from a stream and put it to some beneficial use is comparable with a franchise. This right may have value for the same reason that a franchise or other intangible element of property may have value, that is because the exercise of this right may result in net earnings creating value in excess of the investment in physical property. Whether the market value of the water right, or the investment that was made to secure it, is to be made a part of the rate-base will depend upon whether value or the investment is to be made the starting point when rates are to be fixed.

The courts and the rate fixing authorities, accepting the view of the public, but still generally adhering to the fiction that fair value is the basis of the calculation, not only hold that water rights may have value but that they should appear at their market value in the rate base. But neither the courts, nor public service commissions, nor valuation experts, have yet discovered any dependable method of determining this market value.

Regional Cost of Development Considered

The method of estimating the market value of a water right in the case of water used to supply the needs of an urban population, by comparison with the ordinary or average cost of developing water in the same region in like amount, of like quality and under similar conditions of delivery, has occasionally been applied, but not with satisfactory results.

To illustrate, let it be assumed that the average ordinary cost of supplying water for domestic use in the region in which a water right is to be valued is 10 cents per 1000 gallons. This amount is here supposed to include interest on the investment and cost of opera-

tion. Let it be further assumed that the cost of supplying by the system whose water right is to be valued has been found to be 9 cents per 1000 gallons. A comparison of these costs of supplying water indicates that the value of the water right under appraisal is ascertainable by the capitalization of 1 cent per 1000 gallons. It will readily be seen that under such circumstances a rise of 10 per cent or 1 cent per 1000 gallons in the average regional cost of water production would have the absurd effect of doubling the value of the water right.

Furthermore, in the case of every ascertainment of average regional cost those properties which are least favorably circumstanced must fall above the average to offset those which fall below. The former may nevertheless be entitled to the same standard of treatment as is accorded to the latter. And yet, under this test of value, all of those whose cost of developing their supplies exceeds the average, would have to consider their water rights liabilities and not assets. This is an absurdity and condemns the method.

Neither this method nor a comparison with the cost of developing the next most available supply can be used as a dependable method for determining water right value.

In some sections of the country, as for example in certain portions of California, the demand for irrigation water has nearly if not quite reached the limit of supply. In such regions the depressing effect upon the value of water rights which results from large undeveloped available sources is no longer felt. The earnings that result from the use of the water are large and have become the measure of value and this value is consequently relatively high.

The value of water rights in such sections has an effect upon the value of water rights elsewhere and for uses other than irrigation. The value of water used for domestic purposes, domestic use being imperative, should not be less than that of water used in the same locality for irrigation and if for this purpose it has a high value in one part of the state—the question is asked—why not in another? Such considerations as these are not without effect upon the market value of water rights.

To the extent that the value of a water right as taken into the rate-base other than the natural rate-base of a public service property exceeds the cost of the water right, the owner is conceded a profit or reward for undertaking the development, and this profit or compensation increment might reasonably be expected to bear some definite relation to the general cost of developing water in any region.

The practice of thus making a reasonable allowance for water right value, preferably a percentage allowance on the ordinary regional cost of developing water resources, has not yet been anywhere established, but in the writer's judgment would have merit. If this practice were generally adopted, it would result in fixing with some definiteness the value of water at its source and would remove much of the uncertainty that now obtains in relation to the value of water rights. Moreover, if thus determined, the value of the water right would not be subject to unreasonable fluctuation nor to too wide a range. Where the regional cost of development, including everything

necessary to make the water available for distribution is 10 cents per 1000 gallons and the allowance for water rights is to be about 10 per cent of this amount, or 1 cent per 1000 gallons, a departure of 1 per cent in the cost of water development from this regional average would only modify the value of the water at the source by 0.1 per cent. A 10 per cent departure would be necessary to affect this value by 1 per cent. In other words, when once an amount has been agreed upon and generally accepted as a proper allowance to be made for the value of the water right or rather, when such value is to be created by a suitable allowance of earnings, this value will be fairly stable and being then readily ascertainable, will thereafter when definitely recognized by the public, pass as the market value.

Strategic Value

But in addition to the basic value at its source, a water supply may have additional value due to an established market and an inherent advantage of quality and location and to other circumstances that determine its development cost in comparison with the development cost of competing supplies. Such value may be termed "strategic value."

To illustrate, a riparian ownership which controls a water power may be cited. The case may readily be conceived of such a water power, limited in amount, which is completely controlled by a riparian owner. When such a source of power is to be valued in a region where the market for power is good, where, for example, the water power will be delivered to a market in which it displaces a like amount of power generated by steam, the cost of the latter in comparison with the cost of the former, affords a legitimate means of determining value or, better stated, ordinarily an upper limit of value. The valuation becomes a simple matter when, under such circumstances the power is already fully developed and is in use or is being supplied to a market which takes it all. But when the market for power is undeveloped, some consideration must be given to the uncertainty of achieving the expected results and due allowance must be made for the time that will have to elapse before a return from the sale of power can be realized.

There will, of course, be cases in which an analysis of the cost of generating and delivering power will show the advantage to be with the power developed by steam. This may obtain when from any cause, such as an irregular water supply, the load factor on the hydro-electric plant is unfavorable or when the cost of water development and transmission of power to the place of use is materially higher than it would be from a properly located steam plant. In such cases the hydro-electric enterprise may nevertheless be a legitimate one. It may have been initiated when the price of fuel for generating steam was such that the advantage of cost was temporarily with the water power; or the margin in favor of the steam power may be so small that the recognized advantage and economic value to society in conserving the energy which annually reappears in the water of the stream outweighs any financial disadvantage that may appear from a comparison with steam as a source of power, and justifies earnings that might not under other circumstances be considered reasonable.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Upon the wisdom and farsightedness of water laws and their interpretation by the courts depends in large measure the development of our Western country. The cases herein commented upon illustrate a determined effort on the part of courts to decide in behalf of positive development and beneficial use of our water resources. The author is president of the California State Water Commission.—The Editor.)

GOING CONCERN VALUE AND WATER RIGHTS OF WATER COMPANIES

Denver v. Denver Union Water Co., 38 Supreme Court Reporter, 278

In this case the Denver Union Water Company sought a restraining order in the Federal courts against the enforcement of an ordinance of the City of Denver passed March 3, 1914, fixing water rates, upon the ground that such rates did not afford a fair and reasonable compensation. The contention of the company was upheld by a special master and the District Court, and the matter went on appeal directly to the United States Supreme Court.

The principal points raised in the appeal are the allowances for "going concern value" and water rights.

In upholding the allowance for going concern value, the Supreme Court said:

"With respect to the former item, we adhere to what was said in *Des Moines Gas Co. v. Des Moines*, 238 U. S. 153, 165, 35 Sup. Ct. 811, 815 (59 L. Ed. 1244):

"That there is an element of value in an assembled and established plant, doing business and earning money, over one not thus advanced, is self-evident. This element of value is a property right, and should be considered in determining the value of the property, upon which the owner has a right to make a fair return when the same is privately owned although dedicated to public use."

The amount allowed by the master for water rights was \$1,998,117. There are a number of decisions of the Supreme Court of Colorado holding that water rights belong to the consumer, and not to the company. There is one comparatively recent decision by the same court seeming to hold to the contrary, and it was upon this that the company relied. In referring to the two sets of decisions, the Supreme Court concluded that, as the question is one of such great consequence, and not free from difficulty, it ought not to be passed upon unless the exigencies of the case require it. Deducting the amount allowed by the master for water rights, the valuation of the company's plant as fixed by the master is \$11,417,782. The net return is found to be only 4.28 per cent of such value. The court directly said that it had "no hesitation in holding that the return yielded by the ordinance now before us is clearly inadequate, and amounts to a taking of complainant's property without due process of law. * * *"

This case illustrates how the decisions of the Supreme Court of a state must be weighed by the United States Supreme Court in passing upon a specific case. In *San Joaquin & Kings River Canal and Irrigation Co. v. Stanislaus County*, 233 U. S. 454, the United States Supreme Court held that the water rights belong to the company, and therefore should be valued with the other property of the company in estimating the return to be allowed. The California Supreme Court had not directly passed upon this point, and the

Supreme Court of the United States was therefore not bound by any precedent.

TAKING OF PRIVATE PROPERTY FOR PRIVATE USE PROHIBITED

Gravelly Ford Canal Co. v. Pope & Talbot Land Co., 26 Cal. Appl. Decs., 593

The Gravelly Ford Company brought an action to condemn a right of way for a canal over the property of the Pope company. The canal was intended to irrigate lands exclusively held by Miller & Lux. The right to condemn rested upon the provisions of a California statute approved May 1, 1911 (1911 California Statutes, 1407). The lower court held that the statute gave a right to a company to condemn for the exclusive irrigation of its own lands, but the Court of Appeal interpreted the act to give the right of condemnation to those only who are engaged in public service and, therefore, reversed the judgment. The following paragraph from the opinion is of decided interest in that it indicates that the court will be guided by the will of the legislature where a statute clearly provides for the right of an individual to condemn for private use:

"It is obvious that the question hinges on the meaning of the terms public use. To sustain respondent's contention and to find support for the judgment, we must hold that these terms mean 'public advantage' and not 'use by the public'; our courts of review must about face and join with those courts that have held the terms to mean anything which tends to enlarge the resources, increase the industrial energies, and promote the production power of any considerable number of inhabitants of a section of the state, or which tends to the growth of towns and the creation of new resources for the employment of capital and labor, or contributes to the general welfare. In the absence of unequivocal statutory direction, we are unwilling to sanction a construction of the terms public use, found in the act of 1911, which would be so radical a departure from the construction uniformly given them where elsewhere found in the constitution and laws of the state."

RIGHT OF RIPARIAN OWNER TO RESTRAIN PUBLIC SERVICE CORPORATION

Habermann et al. v. Ellensburg Gas & Water Co.—Wash.—170 Pac. 571

Holmes v. Snow Mountain Water & Power Co., 26 Cal. Appl. Decs. 457

J. M. Howell Co. et al. v. Corning Irr. Co. et al.—Cal.—171 Pac. 100

In the state of Washington, a riparian owner may enjoin one storing or diverting water at a point on the stream above him, which storage or diversion will result in injury to him—provided that the one storing or diverting above is not engaged in public service. The Habermann case illustrates the exception to the general rule.

Habermann and others were lower riparian owners, and attempted to enjoin the Ellensburg Gas & Water Company, which company had expended a large amount of money in changing its place of diversion from a lower point on the stream to one above the lands of plaintiffs. The Supreme Court of Washington held that the company might have maintained eminent domain proceedings, and have acquired whatever rights the plaintiffs had to the waters of the stream. It did not do so, but expended money in construction work, and supplied the city of Ellensburg with the water so diverted. It was therefore held that the plaintiffs were not entitled to an injunction, and that, if they had any remedy, it is an action for damages.

Holmes Case.—In this case Holmes, a riparian owner below the dam of the power company on Eel River, asks that the company be enjoined from continuing to divert the waters of Eel River and also asks damages in the sum of \$5000. Holmes owns land on both sides of Eel River about 200 feet below the dam. The bluffs of the river on his land are from 40 to 60 feet high. The land is broken and while part of it has been cultivated to crops and part of it is irrigable, no water has been diverted from Eel River for use upon the land. In his brief, Holmes abandons any right to either damages or an injunction by reason of the diversion of the flood waters of the stream, which limits the case to the ten cubic feet per second flow during the summer months.

The decree of the lower court gave Holmes two cubic feet per second, leaving to the power company the right to impound and divert the remaining eight of the ten second feet. The lower court further found that the two cubic feet per second allowed Holmes are ample for all his purposes and that no damage would result to Holmes by the diversion of the remaining eight by the power company.

The Court of Appeals upheld the lower court in the following words:

"Under the facts of this case no injury could be done plaintiff by the diversion of that portion of the water of this stream which he could not possibly use, leaving to him a sufficient flow of the stream for all his possible present and future needs. (*Miller v. Bay Cities Water Co.*, 157 Cal. 256; *Cohen v. Le Canada W. Co.*, 151 Cal. 680; *San Joaquin v. Fresno Flume Co.*, 158 Cal. 626; *Stratton v. Mt. Hermon etc.*, 216 Mass. 83.)"

The court held as a further reason why no injunction should issue that Holmes and his predecessors had waited four years after the public use began before action was initiated, and that his right to an injunction is, therefore, barred by this intervening of the public interest.

Howell Case.—In the Howell Co. case, the Corning Irrigation Company sought to bring itself within the above rule. Although the Supreme Court of California stated that the rule applied where companies were engaged in public service, it was shown that the Corning Company was a mutual water company, devoting the water which it diverts exclusively to the use of its own stockholders, and not to the general public. It was, therefore, held that the company cannot be considered as engaged in public service, and is not entitled to the relief prayed for.

RIPARIAN RIGHT DOES NOT ATTACH TO "FOREIGN WATERS"

E. Clemens Horst Company v. New Blue Point Mining Co., 55 Cal. Dec. 440

The Horst Company and other plaintiffs are the owners of land riparian to Bear River. The New Blue Point Mining Company has been diverting the waters from Wolf Creek, a tributary of Bear River, through an old mining ditch which crosses the divide into the watershed of the Yuba River. Part of the waters flowing in Wolf Creek and diverted by the Blue Point Co. are so-called "foreign waters" made up of sewage from the city of Grass Valley and water discharged from mines and mills, all of which water was originally diverted from the Yuba River. In the words of the Supreme Court, "The principal question involved in this appeal is the following: Where the flow of a natural stream is augmented by artificial means, that is by waters which, without the intervention of human agency, would never reach the stream, does this artificial flow inure to the benefit of riparian owners or is it merely in the nature of abandoned personalty which may be appropriated by the first person who can take it from the stream?" In reaching its conclusion that the riparian right does not attach to "foreign waters," the court expressed an attitude which is noteworthy:

"So jealous have the courts of this state been for economy in the use of water and the fair apportionment of the precious fluid for beneficial purposes that they have refused to restrain the diversion of water by a non-riparian appropriator, at the suit of a lower riparian owner, when the amount diverted would not be used by the latter but would greatly benefit the person diverting it. (*San Joaquin and Kings River Canal and Irrigation Co. v. Fresno Flume and Irrigation Company*, 158 Cal. 626; *Modoc Land and Live Stock Co. v. Booth*, 102 Cal. 151; *Fifield v. Spring Valley Water Works*, 130 Cal. 552.)"

As the opinion fixes a very definite limitation to riparian ownership, it should be gratefully received by all those who believe that only through the doctrine of prior appropriation can the fullest development of our water resources be consummated. As there are certain expressions in the opinion which at least would give a good basis to an argument that the court in this opinion meant also to lay down the rule that the doctrine of prior appropriation does not attach to "foreign water," the State Water Commission requested a modification of the opinion. In denying the petition of the other plaintiffs for a rehearing, the court answered the request of the State Water Commission as follows:

"The court does not construe the opinion herein as deciding the question as to what rights may be acquired in so-called 'foreign waters' as between appropriators, or by prescription. The record in these cases presents a controversy between the plaintiffs claiming the waters in question solely by virtue of their lower riparian ownership of the banks of Bear River of which Wolf Creek is a tributary, and the defendants claiming the right to divert the foreign waters of Wolf Creek by virtue of their appropriation and application of the same to beneficial uses." (55 Cal. Dec. 612.)

The above paragraph very clearly shows that the rule laid down in the opinion is restricted solely to the rights of riparian owners in "foreign waters." In former decisions of the California Supreme Court, the right of prior appropriators to "foreign waters" has been upheld. There is no reason to believe that the Supreme Court will change the doctrine.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

LIGHTING CITY PARKS IN PORTLAND

BY F. D. WEBER

(This article on the lighting of parks and boulevards is of interest—not only to the contractor in the larger cities, where park lighting forms a most conspicuous part of the summer illumination problem, but also in the smaller towns, where plans are being developed for the improvement of the lighting systems. Practical and attractive standards and ingenious underground connections mark the Portland installation.—The Editor.)



Laurelhurst Park—note the comfort station at the right in which the substation is housed.

proof joint just below the top. A No. 8 solid copper wire is joined to each of the stranded cables at the terminals for making connections in the lamp socket. The poles were cast in vertical forms with the small end down, as it was thus possible to use for the first 2 feet at the top of the pole a mixture of one part cement to two parts of sand, while the regular one-two-four mix was used for the remainder of the pole. After erection, the standards were finished with a neat cement wash.

About three and one-half miles of the boulevard system known as the Terwilliger Boulevard was installed with 91 standards spaced 150 feet apart.

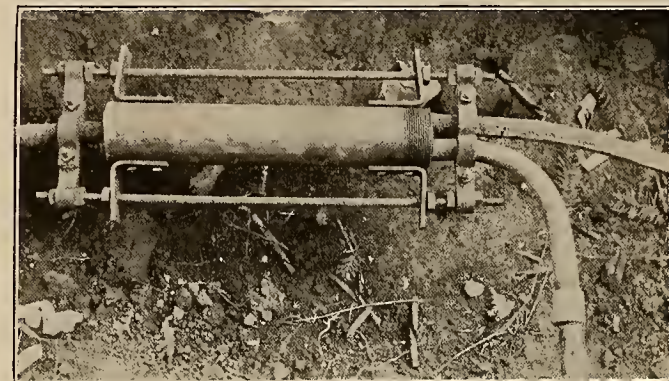
The cost of the installation (1914) was \$12,300. Each pole complete in place cost about \$135, including its share of the distributing line and transforming equipment. The cost of the base concrete poles was approximately \$30 each.

A constant—current series—lighting system is used. Energy is taken from the city distributing mains on 2300 volt lines to the transformers, and goes out at 2600 volts single-phase on double steel taped No. 8 stranded cable. The wiring arrangement is such that eight 2075 foot lengths of this cable were used without splices, all connections being made in the ter-

minals within the standards into which the main cable itself is looped. The current is carried in the distributing lines at 6.6 amp, and a single 400 candle power tungsten lamp is used on each standard in a 20 inch globe.

It was arranged that approximately 100 standards could be served by each transformer set.

Comfort stations are used to house the tub transformers and other substation apparatus. They are constructed both of wood and cement and consist of four



Special device for keeping strain off joints in soft ground where splice is made at base of standard—Terwilliger Boulevard, Portland

rooms—one for tools, two for toilets, and one for the substation, the size of the substation room being 6 feet by 8 feet.

The electrical contractors installing the steel cable, which was placed in a trench, encountered several conditions where it was necessary to overcome them by devising special apparatus. In many places rubber covered wire had to be spliced to steel taped



Special clamps for "Y" connection in soft ground where rubber covered wire was spliced to steel cable—Terwilliger Boulevard, Portland.

cable in soft ground. The accompanying photograph shows the special clamp for a "Y" connection. Also another device is shown, which was used to take the



Lighting System in Laurelhurst Park, Portland

strain off joints in soft ground. The picture shows the splice necessary to be made at the base of a standard. The conduit runs from here to the standard.

COMMENT ON THE GOODWIN PLAN FROM THE NORTHWEST

BY FORRESTER E. SMITH

(The National Association of Electrical Contractors and Dealers stands for something very vital to the interests of even the isolated contractor-dealer in a country town. It means that through his local organization he may affect national policies which would otherwise be formed without regard to his interests. This plea for the Goodwin Plan is of special interest, coming from a man prominent in contractor-dealer affairs who attended the recent meeting of the national organization as alternate for the Washington state chairman.—The Editor.)

We have as local and state organizations been trying to get conditions with regard to central stations, purchasing lamp situations, etc., which can only be brought about nationally. In order to get the things we are after we must have a strong national organization made up of strong local, state and divisional organizations, all working to the same end and tied together with firm bonds. Our interests must not be divided. In a recent article in Collier's, Von Hindenberg is credited with saying, "We must divide men in their interests first of all. After that it is child's play to divide their territory and possessions." Up to a short time ago the National Association had about fourteen hundred contractor-dealer members—this out of some twenty-five thousand in the entire nation. The attention of the contractors in smaller towns is called to the fact that they would be unheard of if their Commercial Club comprised three or four business men out of fifty or sixty in their town.

The biggest thing about the new National Association is that its future plans contemplate organization of the entire electrical industry. When all interests realize that they must get together to put over the Electric Idea, central stations, wholesalers, contractor-dealers, engineers and manufacturers will find it necessary to get a broader vision of the electrical industry.

One of the things that has held organizations of contractor-dealers back is the fear on the part of

the so-called big contractors that they might in some meeting, let some precious pearls of wisdom drop and "educate" some so-called small contractor. I have adopted a new term as follows, "a contractor who does a large business," not a "big" contractor. The writer is also struck with the number of "Electrical Engineer" signs on contractor-dealers' store fronts. I wish it were consistent for them to have "Electrical Sales Engineer" also on their store fronts, billheads, and stationery of all kinds. I think that it is the greatest need we have in the contractor-dealer game today. It has been my pleasure to attend meetings of loggers, lumbermen, manufacturers, sign shops, and whatnot, and the greatest need has always been salesmanship. If the Goodwin plan is not adopted by some of the states now holding back, they will be in the position of the crap-shooting nigger in the story.

It seems that Gus wanted to borrow a dollar from Rastus. Rastus protested that he was shooting his last dollar. He shot and lost and slyly picked another bill from his hatband. Again he shot and lost and remembered he had another dollar in his shirt pocket. Again he lost, and as he reached in the inside of his belt, Gus said: "Just keep on shootin', just keep on shootin', nigger; them bones will make you tell the truth yet."

ORGANIZING THE INDUSTRY

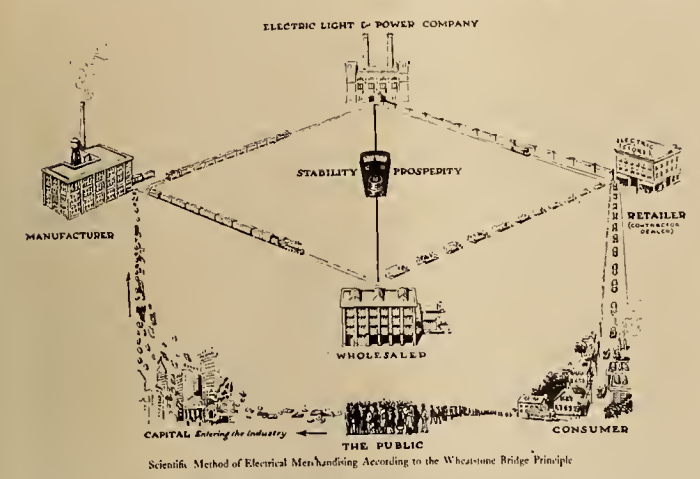
BY W. L. GOODWIN

(For the first time, in the past few weeks, the West has had the opportunity of hearing of the Goodwin Plan at first hand. Although the idea was one which was really developed on the Pacific Coast, before being carried East by its originator, the recent visit of W. L. Goodwin has brought out many new features and advantages. In view of the great interest shown, a brief explanation of the "Bridge" which is the symbol of the plan, is here given in Mr. Goodwin's own words.—The Editor.)

The Wheatstone Bridge furnishes an excellent analogy of the method of scientific merchandising in the electrical industry.

The battery, the source of energy, represents the public whose investors furnish the capital for all branches of the industry. This capital, the manufac-

turer, converts into generating and distributing equipment for the central station or industrial, or into appliances and supplies. His sales diverge as shown in



The Wheatstone Bridge of the electrical industry

the diagram, dependent upon the principal class of product utilized by each branch.
The central station has electric service as its principal product which, it will be noted, is used through

the wiring installed principally by the contractor-dealer.

The wholesaler has as his principal function problems affecting wholesale electrical merchandising. He makes contact with the central station or the contractor-dealer in passing to the consumer.

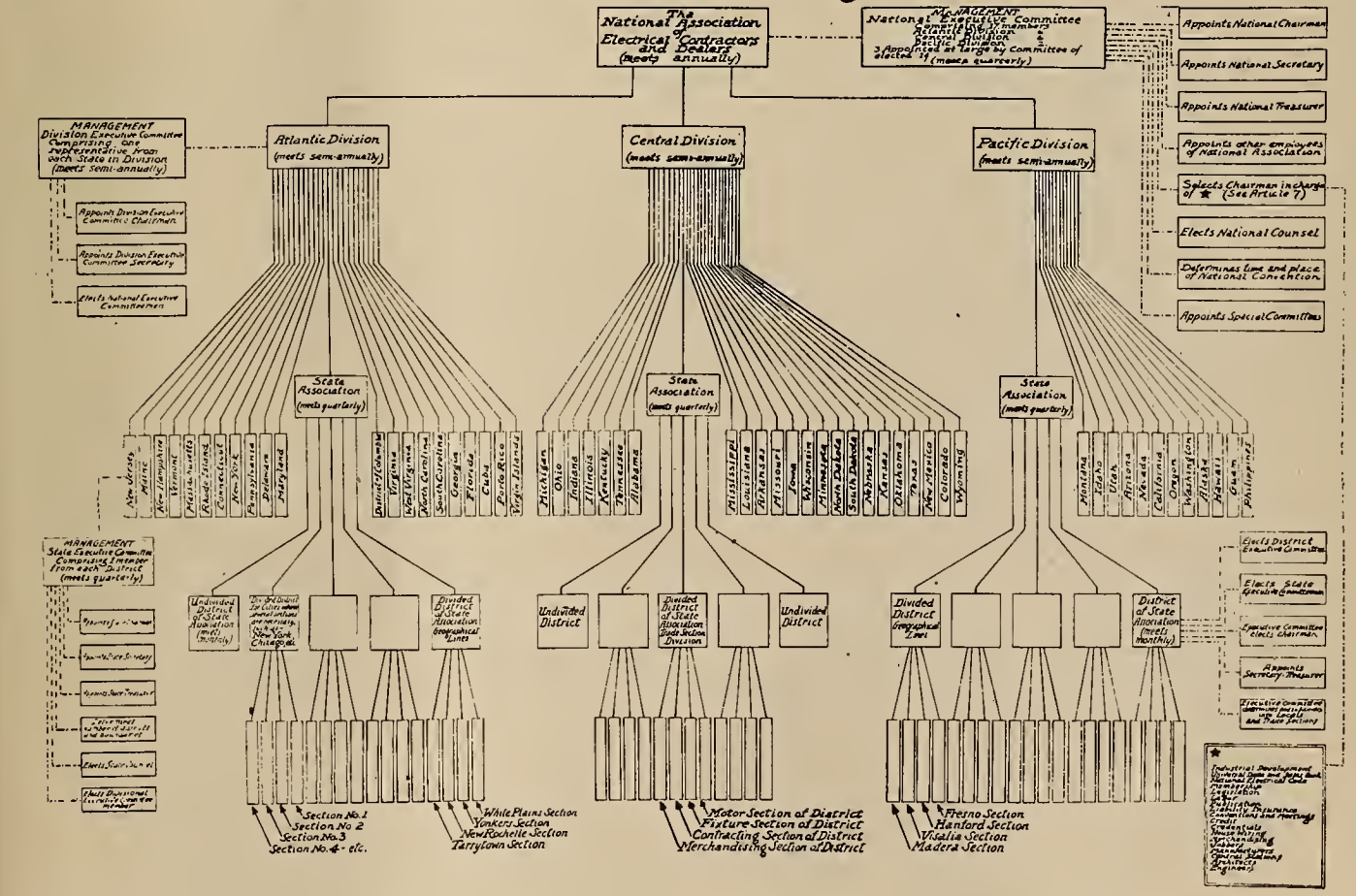
The contractor-dealer thus becomes the point of retail contact of the manufacturer, central station, and wholesaler with the consuming public which, by the way, following the circuit, brings us back to the negative side of the battery, thus completing the analogy.

Nothing in the diagram indicates, nor is it the intention to restrain in any form, either of the interests referred to in performing the function of another, but due regard to the interests of all should be recognized in order that the scientific plan of merchandising under the Wheatstone Bridge principle will not indicate on the galvanometer an unbalanced condition which now exists.

When each interest operates with a due regard to the interests of the others the galvanometer will indicate at zero, an evidence of a balanced condition which when applied to electrical merchandising and the electrical industry, is reflected as stability and prosperity.

National Association of Electrical Contractors and Dealers

Graphic Representation of Organization



THE ELECTRIC SIGN BUSINESS AND THE GOODWIN PLAN

A LETTER TO THE EDITOR

SAN FRANCISCO, May 2, 1918.

To the Editor, Journal of Electricity, San Francisco.

Those of us who were fortunate enough to hear Mr. W. L. Goodwin's inspiring and helpful address at the recent meeting of the San Francisco Electrical Development League left the meeting, not only thankful to Mr. Goodwin for the work he is doing, but with minds turned introspectively to the problems of the group in which he belongs, wondering what its place in the sun will be when Mr. Goodwin's Utopia arrives.

The Place of the Sign Business in the Industry

The electric sign branch is not difficult to place in the new ideal scheme of planning the functions of the industry as outlined by Mr. Goodwin. But there have been many instances of a misunderstanding concerning it. It is hoped you will open your columns to this letter, which presents a few of the problems of our business as it concerns the other branches of the industry, with the belief that this publicity will help to clear the air and assist in solving the problems outlined.

The electric sign business of the states west of the Colorado-Utah line is conducted by eleven manufacturers who sell about \$750,000 a year combined. The largest concern contributes slightly less than one-third to the total, the others grading off to concerns with a volume as small as \$20,000. The electric sign business will never be a large factor, but it will always be with us and it deserves support from all branches of the industry, not only because it is a member of the electrical family, but because of its money contribution to the other branches of the industry. A census of the electric signs in use in the West produced by one manufacturer alone shows that about 1,000,000 lamp sockets, each requiring periodic lamp renewals to the benefit of the lamp and contracting branches, not to mention the daily revenue to the central station or the contractor's labor and material involved in running services to these signs.

The writer believes he voices the sentiments of each of these manufacturers in the following statements, as they are nothing more than what all of us in the business recognize and discuss frankly when we meet.

Selling Through the Retailer

The electric sign manufacturer takes his place in the Goodwin plan as a manufacturer and not as a contractor. The nature of the business requires that he sell direct to the consumer instead of through wholesaler-retailer channels. Right here is where trouble begins, as some wholesalers and retailers believe there should be a price differential sufficient to protect each one and they say the electric sign concerns are not dealing along "regular lines." But the big wholesalers and the clear thinking contractor-dealers do not say this because they appreciate the difficulty of asking a manufacturer for a price differential on an article of merchandise that from its nature cannot be stocked and that requires a totally different type of salesmanship from anything else in their line. The hard truth is that no wholesaler or contractor-dealer has ever made a success merchandising electric signs, and that recently three members of the Pacific Coast Electric Supply Jobbers Association, who operated electric sign manufacturing plants in connection with their own business and marketed the product through their contractor-dealer trade, have discontinued the practice, thus ending the final remaining examples of a condition existing years ago when many wholesalers, contractors, billboard plants, and even central stations, manufactured electric signs.

Commissions to Dealers

Thus, one problem of the electric sign company is to know what to do with the contractor-dealer who writes in saying he has a prospect for an electric sign. There is not one case in a thousand where the contractor can make the

sale of the sign without the assistance of the direct representative of the sign company and still fewer times does the contractor-dealer care to handle the account. Shall the contractor-dealer be paid a commission for turning in the lead? If not—what will justify his continued activity in looking for electric sign prospects? Without going into the details of the argument pro and con, it is the best thought of the electric sign men, and it can be stated as one of the "principles of ethics," as so aptly phrased by Mr. Goodwin, that the electric sign companies will not give commission for leads or discounts to the wholesaler or contractor-dealers; but the sign company will leave to the contractor-dealers the furnishing of lamps and the running of service and connecting of the sign. To those contractor-dealers who are so enterprising as to send in the name of a prospect, the sign company will not look for competitive bids on lamps and service wiring or suggest to the prospect that he do so, but will accept the price estimate of the contractor who furnished the lead, leaving it to the latter's good judgment to keep the price within reason to increase the chance of making the sale.

Correcting Unfavorable Ordinances

Electric sign companies need help from all other branches in the attempt to straighten out the tangles in local electric sign ordinances. The central station branch can be of distinct help in this. It would surprise your readers to know the list of western towns that an electric sign salesman can hardly enter due to some kink in the local ordinance. The writer will not list these because we consider it a direct reflection on the local central station manager that such a condition exists. The electric sign business welcomes intelligent regulation, but it is up to the local central station manager who is in touch with local politics to see that his town has a "workable" sign ordinance. For instance, one well known California town, a county seat, has an ordinance limiting the height of electric signs above the walk to 12 feet. But the town is full of board awnings installed by an ordinance limiting their height to 13 feet, so under an awning there is but 12 inches of space for an electric sign. This condition has persisted in spite of the fact that most large cities have a height limit of 10 feet, which if adopted for this California town, would admit of 3 feet of space beneath awnings suitable for electric signs. Another medium sized city changed its electrical ordinance years ago so that most of the "old work" would be condemned if judged by the new inspection. But the department of electricity ruled that the "old work" was permitted to remain provided there were no additions. A merchant buys a sign believing it will cost him only \$25 or \$30 to erect and connect it. Yet, although the electric sign service is not made on extension of an existing circuit, but is in conduit clear back to the meter board, the department of electricity rules that it is "new work" and before he can run his sign service his entire premises must be rewired. Conditions such as these cannot be changed by the efforts of an outside electric sign company except at an expense too great to contemplate, yet the central station manager could bring it about quickly and easily, if he only would.

Handling Small Town Trade

How to reach the small town trade profitably is another problem the electric sign men are trying to solve. It is comparatively easy to sell electric signs in the multitude of prosperous small towns, but that which happens after the sign gets on the ground determines profit or loss. Unfortunately in the territory of those central stations who believe they are operating on the Goodwin plan it has mostly been loss so far. This is due to the central station's mistaken idea of the Goodwin plan and not to the plan itself, as nobody can believe the Goodwin plan contemplates injury to any branch of the industry. To illustrate, a sign was sold in a small town with the erection and connection cost estimated by the salesman as usually must be the case, since a sign prospect is closed by impulse and will grow cold if a definite figure is not given

him immediately when ready to buy. The sign was shipped and the local contractor-dealer was told to go to the freight office and look over the sign and bid on the cost of erecting it, running service, and connecting. When the bill came in it was for a sum three times his bid with the explanation that as "all necessary material was not sent with the sign as claimed, so the extra labor and material ran pretty heavy." What he had done was to discard the hanging rig sent with the sign and build one of his own. He had no "falls" or block and tackle and had hoisted the sign into place by building a scaffold under it and blocking it up inch by inch. He had blacksmith bills, etc., all neatly shown to prove his claims. Now here is not a case of a contractor purposely overcharging. He did actually put in the work charged for, but due to unfamiliarity with sign hanging, his cost was excessive.

Now, in the old days, the central station did the erecting and its construction man being familiar with handling transformers on top of poles, etc., could put up the sign in half a day. It is claimed by the electric sign companies that this condition must return and the work of the electrical contractor restricted to running the service, etc. This seems a small matter, but it is vital to the success of the electric sign business in the small town. If the central stations will not take over the work of getting the sign up on the face of the building, letting the contractor-dealer run the service, the industry will be forced to refrain from going into the small towns where such conditions exist.

Co-operation

From this as a first step, the central station can then go on as it may desire to other forms of co-operation such as collecting term payments, assisting to finance the term payments, installing a patrol service to turn sign on and off at

stated hours, etc. But many central stations refuse even the first step, stating they are leaving all merchandising to the dealers, etc. Such an attitude is not co-operation. It is strangulation.

The things referred to herein seem reasonable and simple of accomplishment, but it is these simple things that are difficult to bring about nevertheless, and it is hoped the publicity you have accorded this letter will assist the formation of correct policies toward the electric sign business by central station, wholesaler and retailer.

Yours very truly,

T. W. SIMPSON,

Western District Manager Federal Sign System (Electric).

"TYING IN" WITH NATIONAL ADVERTISING

BY W. F. BRAINERD

(A chance for real co-operation which will mean better business for both contractor-dealer and manufacturer is here pointed out by the northern California representative of the California Electrical Co-operative Campaign.—The Editor.)

Possibly one of the biggest helps the dealer gets in the sale of his goods is the national advertising, appealing to the consumer carried by the electrical manufacturers. These ads cost a big amount of money, but they pay or they would not continue to appear year after year.

As the magazines are circulated in every city in the United States that is large enough to support an electrical dealer, it is safe to assume that some readers

The image displays a collection of vintage advertisements from 1918. At the top, a 'Hotpoint' ad promotes 'the food saving—fuel-saving way' and mentions the 'America's Service Army'. Below it, a large 'Westinghouse' advertisement features a circular graphic and the text 'RESIDENCE AND COMMERCIAL FANS'. To the right, another 'Westinghouse' ad is titled 'FOR THE HOUSEHOLD' and 'ELECTRIC UTILITY'. In the bottom left, a 'Western Electric' ad shows a woman using a 'Portable Sewing Machine' with the headline 'Why it will almost go in my knitter'. The bottom center features three 'EDISON MAZDA' light bulb advertisements, each with a different illustration. On the bottom right, a 'UNIVERSAL Home Electric Needs' ad is partially visible, showing a woman and the text 'UNIVERSAL Home Electric Needs'.

Some of the national advertising appearing in leading magazines, of which the contractor-dealer should take advantage

in every town are more or less interested. The dealer's problem then is to get these more or less interested prospects into his store.

Many dealers watch this national advertising closely and feature the nationally advertised article in their local advertising. In addition to the newspaper advertising, they make window displays. To make the connection between the window display and the magazine advertising, they paste on the window the page of the magazine containing the ad. One live dealer even goes so far as to refer in his local ads and window cards to "OUR ad in the Saturday Evening Post this week." He has the proper idea. It is his ad or the ad of any dealer that wants to take advantage of it, as the manufacturer can not get one cent return on his advertising investment until the dealer has first made his sale and taken his profit.

Technical Hints

BY GEORGE A. SCHNEIDER

ELECTRIC FANS—THEIR SELECTION AND INSTALLATION

(The proper selection and installation of fans is one of the greatest safeguards of the electrical dealer for a prosperous summer trade. The questions of just where to locate the fan and what type and number are needed for a given space and purpose are the first problems of a customer—or of an electrical man himself making the installation. These matters are here considered from a practical standpoint by the manager of the Buffalo office of the Western Electric Company.—The Editor.)

Few, if any, of the so-called popular electrical devices afford more genuine comfort in the summer than fans. The fan in summer is comparable to the heating system in winter. They are required in the home for the health and comfort, in the industrial establishment for efficiency and comfort and in the store and public place for increased patronage and comfort.

Fortunately, the very best of modern electric fans can be had in a large variety of sizes and types at prices which are low enough to keep them out of the luxury class. This is of course made possible by the wonderful modern manufacturing methods which have contributed so much in countless ways to the comfort and progress of humanity. Not only are the first costs reasonable, but the operating costs as well are extremely low. Further, with reasonable care these fans will last through many seasons and give many hundreds of hours of satisfactory service.

Types of Fans

Fans depending upon their application are generally divided into two classes. First, those which are designed simply to remove vitiated air and are commonly known as ventilating or exhaust fans. Second, fans which do not exhaust but stir up or agitate the air or serve to aid in directing the air currents in a desired direction.

Exhaust and ventilating fans are made in two general types. The smaller sizes—12 and 16 inch—are usually modified forms of standard non-oscillating fans mounted in a suitable supporting ring. These are commonly known as ventilating fans and are intended for use where the air passages are entirely open. The other types—commonly called exhaust fans—are made

in sizes ranging from 12 to 60 inches, inclusive, and are intended for use where larger volumes of air are to be handled and where the openings are likely to be somewhat obstructed; for example, in connection with piping leading from the ventilating hood over a range to the outside of a building. These fans have specially designed blades to make them more suitable for this service than the ordinary fan blade and, further, have a larger number of blades or individual wings so they may handle a large volume of air and still be operated at a lower speed to reduce noise.

There are, however, many types of agitator or buzz fans, as they are sometimes called, in the market, each being designed for some particular application or service. The differences in design are largely due to the methods of mounting. Thus, there are ordinary desk and bracket fans, ceiling, floor and counter column fans, telephone booth fans and several other types. The desk and bracket fans are further made in both stationary and oscillating types and the ceiling and column fans may be of the gyrating type.

Standardization

During the past few years the various manufacturers of fan motors have been endeavoring to standardize the various types and sizes. Much has been accomplished along this line, but there is still further progress to be made in the future. Not only are the fans being standardized but attention is being given to the methods of packing, the length of cord to be furnished, the kind of attachment plugs to be used, and several similar important questions. Further, nomenclature applying to fans is also receiving attention. For example, the old term "desk and bracket" formerly applied to certain types of fan motors, has been superseded by the term "non-oscillating" since practically all fans which can be used as desk fans are also suitable for bracket service.

Full information on the various types, sizes and kinds of fans now available in the market can be obtained from the manufacturers' catalogues, so the remainder of this article will be devoted to the selection and installation of fans. Further, only matters relating to the agitator fan will be discussed. However, it is well at this time to note briefly the difference between exhaust and agitator fans and their function, because this question comes up so frequently during this season of the year, and so many purchasers—and many dealers, too—do not realize the distinction that should be made between these two different types of apparatus.

Function of Exhaust and Agitator Fans

An exhaust fan is not intended for cooling the air but, as stated in a foregoing paragraph, solely for removing impure or vitiated air which the normal ventilating air currents do not remove with sufficient rapidity to keep the air pure and prevent stuffiness. No cooling effect will be obtained by the installation of an exhaust fan unless the air flowing in to replace that removed by the fan is cooler than the air replaced.

On the contrary, desk and ceiling fans are intended to produce a sensation of coolness. They will not prove of value in removing vitiated air, or changing the air in a room unless placed near an opening so the air currents are directed out of the room. Even

under these conditions they will actually remove the air only to a limited extent.

The cooling effect is due to the evaporation of moisture from the surface of the body. During this process heat is drawn from the body, thus effecting an actual reduction in temperature. These fans simply set in motion air currents, which if close to the body will bring fresh dry air in contact with the skin and greatly assist evaporation, thus producing the sensation of coolness.

Principles of Selection

No fixed rule for the selection of fans can be given. In restaurants, stores, show rooms, offices, factories and public places of a similar character the arrangement of the interior will usually determine the type of fan which should be used. The size of the rooms will in turn determine the size of fans and number required. In general, non-oscillating fans are used for long narrow rooms and where there is no objection to a steady breeze in one direction. Where several fans are used they should be pointed to direct the air currents in the same general direction. Oscillating fans are most suitable for comparatively wide rooms. To secure the best results the center of oscillation should be pointed across the room. Oscillating fans are a considerable improvement on the stationary or non-oscillating fan, since they distribute the breeze over a larger area by swinging from side to side, and are therefore more economical to use for large areas than a fan throwing a breeze in a fixed direction. Ceiling and column fans are suitable for large interiors or where the wall space is taken up by shelves or other fixtures and when no columns are available for mounting bracket fans.

The distribution of air from standard paddle blade ceiling fans is not very satisfactory because the air is thrown downward over a rather limited area, generally not much larger than one and one-half times the diameter of the blades. The breeze outside of this area results from the re-direction of the air currents as they strike the floor, counters, tables or other surfaces within this area.

Gyrating fans give a greater distribution of air and less direct draft than ceiling fans. In fact, the distribution of air from this type of fan is ideal. For this reason they are rapidly becoming very popular.

As a general guide in selecting sizes and locations of fans, especially for large areas, the following table arranged by one of the large manufacturers of fans, will be found useful:

GUIDE FOR SELECTION OF FANS

Distance from Wall to Wall	Non-Oscillating Fans	Oscillating Fan	Distance Apart when Fans Are Placed in a Row
Up to 12 feet....	8-inch	10 to 12-inch	15 feet
12 to 15 feet....	10 to 12 inch	12-inch	20 feet
15 to 20 feet	12-inch	16-inch	25 feet
20 to 30 feet	16-inch		30 feet
Larger	32-inch Ceiling Fan		20 feet
	56-inch Ceiling Fan		40 feet
	Gyrating Fans		25 feet

Positions of Mounting

Fans mounted along walls should be placed on opposite walls, but preferably not directly opposite each other, so that all parts of the room will receive a movement of air. The spacings shown in the last column to the right in the table indicate the distance apart on each wall.

For interiors of not more than 30 feet in width, the 32-inch ceiling fan will give good results. For large areas, two rows of 32-inch or a single row of 56-inch fans will be required. In either case the spacings between fans shown in the table should be observed. Gyrating fans will cover about the same area as a 56-inch ceiling fan, but it is better to space them a little nearer to each other as shown in the table.

Where ceilings are too high for mounting ceiling fans or where they would be otherwise objectionable on account of the appearance or construction of the ceiling, counter or floor column fans may be used to good advantage. These may be of the ordinary paddle type or of the gyrating type, both being on the market. These fans will give satisfactory results when mounted from 30 to 40 feet apart. The blades of either ceiling or column fans should not be less than 8½ feet above the floor and in some cases a greater distance will be advisable.

Fans in the Home

For the home the choice is limited to a lesser number of types. The most popular seems to be the 12-inch 6-blade residence fan. This fan operates at a slower speed and makes less noise than a 4-blade high speed fan of the same size, but at the same time moves practically the same volume of air. This fan can be had in both oscillating and non-oscillating types, but the former is probably best for general service because of the wider distribution of breeze.

A large number of 6 and 8-inch fans are also used in the home and have proven quite satisfactory for small homes. However, in purchasing fans of these sizes and especially the smaller, one should select a fan built along the same general lines and with the same care as larger sizes of fans. Many of these 6-inch fans are really little more than toys and have a limited life, due to their poor construction.

The best place to put a fan in the home is generally on an open window sill to draw in the fresh air, except where there is only one window in a room, when the fan should be mounted on the opposite side of the room to blow toward this window. This will assist the natural circulation of air. In any case care should be taken not to allow the strong currents of air to be directed continuously against a person as this will probably result in developing slight colds or muscular soreness. Special caution regarding this point is advisable when fans are used in sleeping rooms.

Other Uses

Agitator fans are valuable for many purposes other than producing comfort by reason of better air circulation. A very important one for which the ceiling fan is of recognized value is to create a draft to drive away flies and insects from the street door of a store or away from eatables within the store. For this purpose the smaller ceiling fan usually from 32 to 36 inches in diameter, but operating at higher speeds than the larger ceiling fans, give the best results and at the same time are small enough to fit into almost any doorway.

Lack of space prevents a discussion of fans and their uses for various classes of service except in a general way. However, in later issues several additional articles on this subject will appear in this department.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(The importance of a precise statement of the claims in the application for a patent is brought out in the important mining case now before the courts. The principles involved are of the greatest interest and well illustrate what might be urged as parallel contentions in the case of your electric patent. The authors are prominent patent attorneys of the firm of White & Prost, San Francisco.—The Editor.)

MINERALS SEPARATION, LTD., DECISION

In the case of Minerals Separation Ltd., plaintiff-appellee vs. Butte & Superior Mining Co., defendant-appellant, brought for the infringement of the Sulman, Picard and Ballot patent for an ore concentration process, the Circuit Court of Appeals for the Ninth Circuit, on May 13, 1918, rendered its decision reversing the lower court and ordering the suit dismissed.

This suit has attracted attention throughout the country on account of the immense sums at stake and the effect of the decision therein on the mining industry.

The patent, in suit, covers a process of concentrating ores, which consists in mixing the powdered ore with water, adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter, agitating the mixture until the oil-coated mineral matter forms a froth, and separating the froth from the remainder by flotation.

Some of the claims of the patent are expressly limited to the use of oil "amounting to a fraction of 1 per cent on the ore."

Claims 9, 10 and 11 specify the use of "a small quantity of oil," and, therefore, are not limited to "a fraction of 1 per cent," as are the other claims.

In the case against James M. Hyde, the Supreme Court, on December 11, 1916, adjudged the "small quantity" claims void but held valid the "fraction of 1 per cent" claims.

In the Butte & Superior Mining Co. case, Judges Ross and Hunt rendered opinions to the effect that the claims, containing the words "amounting to a fraction of 1 per cent on the ore," were limited to the use of oil not exceeding one-half of 1 per cent on the ore. As the defendant had never used, in its process, oil in a quantity as small as one-half of 1 per cent, the Court adjudged it had not infringed and ordered the suit dismissed.

Judge Morrow filed a dissenting opinion in respect to the finding that the "fraction of 1 per cent" claims were limited to a fraction of "one-half" of 1 per cent, or a lesser fraction. In his opinion, Judge Morrow said:

"I am of opinion that the use of an oil or oily liquid in defendant's separation process in a quantity not 'amounting to more than a fraction of 1 per cent on the ore' is within the express terms of claims 1, 2, 3 and 12 of plaintiff's patent, and is an infringement of such patent. But I am of opinion that the use of oil or oily liquid in a quantity amounting to more than a fraction of 1 per cent on the ore is not within the terms of claims 1, 2, 3 and 12 and is therefore not an infringement upon plaintiff's process and that a decree should be entered accordingly."

The determination of the question of infringement depended, primarily, upon the construction and interpretation to be placed upon the Supreme Court opinion in the Hyde case.

Plaintiff contended said opinion should be construed as finding and contemplating the existence of the following facts:

1st. That plaintiff's patented process differed from prior art processes, in respect to its "mode of operation," resulting in the production of a mineral bearing froth differing substantially from prior art froths.

2nd. That this new "mode of operation" was due, not alone to the small percentage of oil used, but also to the character of oil used.

3rd. That the patent gives an example of the kind of oil to be used, to wit: oleic acid.

4th. That oleic acid is a "frothing" oil, capable of producing the kind of froth necessary to the success of the process and characterizing its mode of operation.

5th. That the patent claims cover, not only oleic acid, but all equivalent oils, that is, all oils having such froth making capacity.

6th. That the claims, in specifying the percentage of oil to be used, refer, by necessary implication, back to the particular oil mentioned in the specification and to equivalent oils, to wit: frothing oils; and do not refer to, include or take into account non-frothing oils.

Plaintiff also contended that defendant used only a fraction of 1 per cent of frothing oil and, therefore, infringed the patent, notwithstanding it used, in addition to such frothing oil, a non-frothing oil which brought the total amount of oil used up to 1 per cent or more on the ore. Plaintiff contended such non-frothing oil did not change the mode of operation of the patented process, nor the character of froth produced, nor the valuable results attained thereby; that it was a non-functioning liquid that had no more effect on the process than so much milk or any other non-functioning liquid that might be added.

Plaintiff also contended that the Supreme Court did not find the "small quantity" claims void merely by reason of the fact that they were not limited to the use of a "fraction of 1 per cent" of oil, because such a finding would be tantamount to holding the invention resided merely in reducing the quantity of oil used, which would be inconsistent with the general rule of law that a mere change in degree, quantity, size, proportions, etc., generally does not amount to patentable invention.

Plaintiff, therefore, urged that the "small quantity" claims were held void merely because they were not limited to the results attained, that is, were not limited to the "new mode of operation" characterized by and due to the use of frothing oil in "a fraction of 1 per cent on the ore."

The defendant's contentions were:

1. That the patented invention resided "merely" and "only" in the reduction of the amount of oil used in prior art processes.

2. That the patent claims refer to all kinds of oil and should not be construed as referring only to oleic acid or equivalent oils, to wit: frothing oils.

3. That the Supreme Court found that the invention resided in using not more than one-half of 1 per cent, or lesser fraction, of oil on the ore, and that, therefore, the claims, specifying a fraction of 1 per cent, must be construed as covering only the use of one-half of 1 per cent, or lesser fraction.

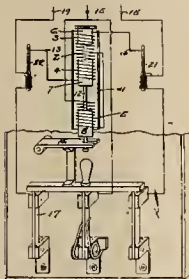
4. That defendant always used more than one-half of 1 per cent of oil and, therefore, did not infringe, although it admittedly used less than one-half of 1 per cent of a frothing oil, to wit: pine oil, which constituted a portion of the total amount of oil used by the defendant.

The Court of Appeals' decision will probably be reviewed by the Supreme Court and, until a decision is rendered by that tribunal, the mining world will remain in doubt as to just what scope will finally be accorded the claims of this much-litigated patent.

NEW IDEAS FROM THE WEST

Alternating Current Solenoid

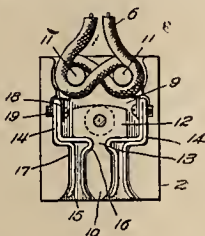
Patent No. 1,259,202, issued to Sydney N. Baruch of San Francisco and assigned to the Baruch Electric Controller Corporation, discloses a novel form of alternating current solenoid. The object of this invention is to provide a polyphase solenoid in which the tractive efforts of all of the phases are exerted in one line and in which the pull on the cord remains substantially constant during the period of an alternation.



The solenoid of this invention consists of a plurality of solenoid sections connected to different phases of the polyphase circuit arranged in axial alignment and separated so that interfering fluxes are avoided. The solenoid is formed of coil sections arranged on a single axis and spaced apart from each other and preferably consists of two coils, one coil section being wound over to superposed on the other.

Electric Attachment Plug

Patent No. 1,259,609, issued to Harry W. Denhard of San Francisco and assigned to the Cutler-Hammer Manufacturing Co., shows an improved form of electric attachment plug. This plug consists of a two-part insulating base having recesses in the adjacent faces into which contact clips are set



and in which the clips are held without being fastened. Each base part is also provided with two spaced studs around which the line conductors are wound so that they take the strain which is placed on the cord.

Submarine Cable

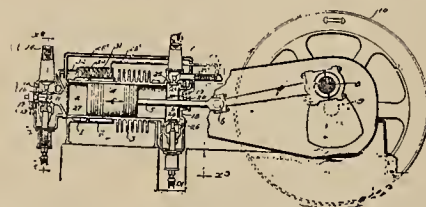
Patent No. 1,259,344, issued to Edwin W. Beardsley of San Francisco and Philip W. Ham of Oakland, shows a new form of submarine cable for the transmission of electric currents.



This cable is composed of a central metallic supporting cable covered with insulation and spirally wrapped around the supporting cable are a plurality of insulated electric conductors. Surrounding the insulating conductors is a lead sheath which provides a water-tight case and steel armored wires are spirally wrapped around the lead sheath, the joints between the armored wires being covered. The function of the steel armored wires is to act conjointly with the central metallic supporting cable to relieve the electric conductors of any strain.

Apparatus for Producing Power

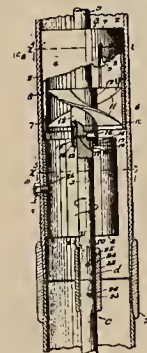
Patent No. 1,258,713, issued to David H. Smalley of South Pasadena, Cal., discloses a novel form of internal combustion



engine in which power is applied to both ends of the piston. This engine comprises a cylinder having a piston movable therein. A combustible charge is introduced into the cylinder behind the piston and a charge of air is introduced into the cylinder in front of the piston. The combustible charge is ignited, driving the piston forward and compressing the air in the other end of the cylinder, and means are provided for transferring some of the heat of combustion to the air so that the pressure of the air is increased and operates to drive the piston back.

Rotary Runner Pump

Patent No. 1,259,124, issued to James R. Palmer and Fenn H. Palmer of Los Angeles, discloses a new form of rotary runner pump. This pump is designed to be installed



in the well casing and includes a shaft on which is mounted a rotatable propeller for forcing the liquid up through the casing. Introduced between the casing and the propeller is a cylindrical sleeve having a smooth internal surface to reduce friction of the liquid at that point. The sleeve is spaced from the casing and is rotatable with the propeller and is provided with tangential slits so that a supply of the liquid can pass through the sleeve and produce a pressure between the sleeve and the casing.

SPARKS—Current Facts, Figures and Fancy

(Electric fans in India, electric kitchens in England, electric lights and telephones in Russia and China, and electric drills and ranges at home, mark the spread of the electrical era. An interesting safety first contest inaugurated by a Western power company which places the emphasis on good health as well as accident prevention, offers food for thought.—The Editor.)

A new means to meet the present labor shortage is found in the good health competition which has been started by a Western power company as a war measure among its employees. This is coupled with an accident prevention contest, illness to be counted against the power plants entered just as an accident.

* * *

A case where a piece of insulated 14-gage copper wire was completely gnawed in two by rats was reported recently. The wire fed a fixture hung from a hollow beam which formed a part of the false ceiling in a confectionery store. Rats had entered the hollow beam and gnawed at the wire. When the light went out, wiremen made this unusual discovery.

* * *

The largest reinforced concrete building in the world is reported from St. Louis. It has one 26-foot story below ground and six stories above ground. There were over 81,000 cubic yards of concrete used, and 121,560 barrels of cement, with more than 6,700 tons of steel. The ground area is 117,000 square feet, and the floor area over a million square feet.

* * *

Even Greenland has its newspapers. For many years, for example, there has been printed in Eskimo a newspaper with the tongue-twisting title of Atua-gagdlinnit, which, being interpreted, is "Something for Reading." One odd feature of the paper is that there is little personal news, and names, those of natives at least, are rarely printed, as it is held to be unlucky.

* * *

The part played by electric drills in the game of war is shown by the computation that 70 drilled holes are required in every three-inch shrapnel shell, in every rifle 90, machine gun 350, torpedo 3466, war plane 4089, war truck 5946, war ambulance 1500, three-inch field gun 1280, gun caisson 594, and anti-aircraft gun 1200.

* * *

National kitchens have been established in various communities in England where community cooking is done at nominal prices in the interests of economy, both of foodstuffs and fuel. Of three such in one city, one is fitted for operation with gas and two for operation with electricity. The electricity Committee is to provide the electric cooking apparatus at the same price as the apparatus in the gas kitchen, and will maintain the two electric kitchens at the same price per kitchen as the gas kitchen.

* * *

Says the bank report of the exportation of electric fans: "Of nearly half a million dollars worth of electric fans exported in 1917 the largest market was in India where the boy operator of the 'punkah' (a swing-

ing fan suspended from the ceiling) holds the world's record for somnolence, while Hong Kong, the Straits Settlements, China, Japan and even Siam show a disposition to substitute the new-fangled but always reliable breeze producer for the uncertain methods of earlier generations."

* * *

An electrical man recently returned from Russia reports that Petrograd and Moscow have as many telephones per 100 inhabitants as Paris, Vienna and Budapest, and that, in spite of high rates, poor service and limited toll facilities. The seven leading towns in Russia are as well telephoned as a similar number of large towns in France, Austria, Hungary, and twice as well as Italian towns. When a Russian municipality places an order for an electric light plant, it usually is forced to order an extension before the original plant is installed, being overwhelmed by applicants.

* * *

When the housewife starts a coal fire to cook a meal her coal efficiency is about 2 per cent—that is, in one ton of coal burned 40 pounds of it have gone into the bread she baked, the cereal she cooked, or the washing she did; and 1960 pounds of the coal have gone up the flue, or radiated from the top and sides of the stove, contributing greatly to her discomfort, saying nothing of the waste of labor incurred by her shoveling 1960 pounds of coal into the stove and cleaning out and carrying away 200 to 500 pounds of ashes. The moral is—use an electric range.

* * *

The native gentry of Tungchow are going to form a company for the installation of electric light in that city, while Paoting natives are also about to do the same. This shows that electrical business in China will be greatly improved as the natives in the interior cities begin to appreciate the value of electric lighting instead of the candles or oil lamps they are accustomed to. The Tokio government is giving financial subsidies to a Japanese company for the unification and improvement of Japanese electrical enterprises in China, so as to compete with Western merchants upon the termination of the war.

* * *

Hydroplanes are to be used in facilitating American trade with Siberia. Notices are appearing in Russian newspapers telling of the 1918 expedition of the Siberian Steamship, Manufacturing & Trading Company from the United States to the mouths of the Ob and Yenisei rivers. This will be the seventh annual expedition to Siberia undertaken by the concern in question by way of the Kara Sea. For the first time hydro-airplanes will be used this year to point out ice-free waters.

PERSONALS

Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company, with headquarters

at Stockton, Cal., has been elected president of the Pacific Coast Section, N. E. L. A. The two preceding terms of presidency have been most ably filled by R. H. Ballard, vice-president of the Southern California Edison Company, and H. F. Jackson, president and general manager of the Sierra and San Francisco Power Co. Mr. Kahn received his technical education at Purdue University during the time when that institution produced so

many noted engineers in embryo. Since graduation he has for years proved himself an able executive in helping to build up the remarkably strong esprit de corps so well recognized in the Byllesby organization, of which his present company is a subsidiary. A year of strenuous activity is ahead for the Pacific Coast Section, N. E. L. A., and it is confidently expected on all sides that Mr. Kahn will carry the now widely acknowledged effective work of this section to even higher planes of usefulness.

F. N. Huddleston, chief assistant city engineer of Salt Lake City, Utah, has recently resigned.

A. L. Bradley, chief electrician with the Hammond Lumber Company, has returned to Eureka, Calif., from San Francisco.

R. J. Davis of the Century Electric Company left recently for the East, where he will visit the home establishment of his company at St. Louis.

Marion S. Barnes has returned to San Francisco from Schenectady and will be located in the San Francisco office of the General Electric Company.

H. H. Thedinga, representative of Garland-Affolter Engineering Co. at Seattle, has returned from a visit to the company's main offices at San Francisco.

J. C. Rockwell has been promoted from manager of the light and power department to general manager of the Manila, P. I., Electric Railroad & Light Company.

H. G. Cloud has resigned his position with the Pacific States Electric Company in Oakland to become an instructor in the aviation school at the University of California.

T. H. Jordan, electrical salesman with the Pacific Power & Light Company at Yakima, has resigned and accepted a position with the Brokaw-Eden Washing Machine Company.

H. C. Mahaffey, formerly plant superintendent with the Pacific Power & Light Company at Lewiston, has been transferred to Walla Walla as superintendent of the plant there.

A. L. Harris, formerly industrial engineer with the Pacific Gas & Electric Company, has opened offices as consulting industrial engineer in the Hobart Building San Francisco.

W. H. Brown, general manager of the Red River Power Company at Grand Forks, N. D., was a member of the general committee in charge of the Liberty Loan campaign at Grand Forks.

C. L. Jacklett, formerly district manager at Prosser with the Pacific Power & Light Company, has been appointed district manager at Toppenish, vice G. I. Drennan, who is on leave of absence.

H. A. Lemmon, of the Truckee River General Electric Company of Reno, and food administrator for Nevada, has been spending some days in San Francisco on business connected with his government work.

First Lieut. W. D. Mel, formerly with Pacific Gas & Electric Company in San Francisco, has returned from Fort Monroe, where he has been stationed, and is now at the Presidio.

G. L. Oman, Northwestern manager of the Pacific States Electric Company, made a hurried trip to California recently, owing to the death of his father in Sacramento. He remained in California for a few days.

Marion Bunnell, niece of Albert H. Elliot, secretary of the Pacific Division of the National Electrical Supply Jobbers Association, has joined the electrical sales force of the Baker-Joslyn Company in San Francisco.

G. W. Milliken, resident manager of the La Junta division of the Arkansas Valley Railway, Light & Power Company, La Junta, Colo., was county chairman of Otero county for the Third Liberty Loan campaign.

Frank D. Fagan, western sales manager of the Edison Lamp Division of the General Electric Company, has been newly elected to the position of director on the board of the Home Industry League of California.

H. F. Albright, vice-president and general superintendent of the Western Electric Company, recently made a quick trip to Japan. He sailed in the middle of March and was scheduled to return about this time to Hawthorne.

J. T. Urquhart, formerly district manager of the Pacific Power & Light Company at Vancouver, Wash., has resigned to go into private business, and **W. D. Myers**, formerly district manager at Hood River, is transferred to Vancouver.

H. H. Griffiths has joined the selling organization of the Electric Railway and Manufacturers' Supply Company at San Francisco as lamp specialist, bringing to the work the results of his wide experience with Eastern lamp manufacturers.

H. I. Markham, general manager of the Federal Sign System (Electric), with headquarters in Chicago, is now visiting cities of the Pacific Coast states in company with **Tracy W. Simpson** of San Francisco, western sales manager for the company.

Captain Richard L. Smith of the Engineer Reserve Corps was able to obtain sufficient leave from his duties to attend the banquet at the Del Monte Conventions on Friday evening. As Captain Smith was formerly associated with the Southern California Edison Company, he received a tremendous ovation upon entering the banquet hall.

W. H. Merrill, president of Underwriters' Laboratories, Chicago, has been appointed Section Committee Chairman of

the newly organized Fire Prevention Section of the War Industries Board of the Council of National Defense. Mr. Merrill is now in Washington to assume the duties of the new position for the period of the war. State fire marshals, municipal fire prevention bureaus, insurance boards, bureaus, associations, companies—in fact all existing fire prevention organizations—are being enlisted by the Section in a co-operative effort to avoid interference of

the government's program through fires in munition plants and government establishments. Mr. Merrill brings to the Fire Prevention Section the experience in fire prevention engineering gained during a period of 25 years of active participation in nation-wide fire prevention work. He started as an electrical inspector in Boston and Chicago and later worked out the idea and organization of Underwriters' Laboratories established and now maintained for service—not profit—by the National Board of Fire Underwriters. The steady growth and valued service of the Laboratories demonstrates the executive ability which Mr. Merrill brings to the new Section created to aid in winning the war.



Arthur R. Kelly, a well known consulting valuation engineer with headquarters at San Francisco, was an interested attendant at the Del Monte convention sessions.

W. A. Thompson has resigned as general agent for the Federal Sign System (Electric) at San Francisco and Oakland to become Northwestern district manager for the Novelty Electric Sign Company, making his headquarters at Boise, Idaho.

W. E. Jones, western representative of the Economy Fuse & Manufacturing Company, with headquarters at Seattle, has returned again to the Northwest after a profitable visit in California cities, including the sessions of the convention at Del Monte.

D. E. Harris, vice-president of the Pacific States Electric Company, and H. E. Sanderson, western manager of the Bryant Electric Company, with headquarters at San Francisco, have gone East to attend the Jobbers' convention at Hot Springs, Va., and are to spend some time in the East.

R. P. Teele of the U. S. Department of Irrigation and Drainage investigations, has been in Oregon recently inspecting the North Unit and Suttles Lake Irrigation Districts. Within the past month his department has moved from Washington, D. C., and headquarters in the future will be at Berkeley, Cal., Samuel Fortier in charge.

C. H. Beal, petroleum technologist of the U. S. Bureau of Mines, who has been stationed in the Washington office for the past two years, has been transferred to the San Francisco station. He expects to leave in a few days for an extended trip through the mid-continent field, where he will make a study of methods used in that district for estimating the future production of oil wells.

M. J. Gavin, formerly chemist for the Shell Oil Company of California, with headquarters in Oilfields, Cal., has recently received an appointment as assistant refinery engineer in the U. S. Bureau of Mines. Mr. Gavin will have charge of the chemical laboratory at the San Francisco station. He is at present in the East visiting the laboratories of the Bureau at Washington, Pittsburgh and other Eastern points.

Mortimer Fleischhacker, vice-president of the Northwestern Electric Company, passed through Portland recently on his way to his home in San Francisco from Washington, D. C. Mr. Fleischhacker is a member of the national board of mediation appointed by the administration to handle labor troubles in the shipbuilding industry in the district around San Francisco bay, and his recent trip to Washington was in connection with the labor situation in that district.

L. A. Somers, manager industrial division, Westinghouse Electric & Manufacturing Company, of San Francisco; Supt. Card of the Standard Oil Company, and his assistant, and Octavius Walthall, field superintendent of the San Joaquin Light

Kay Ingerslev, electrical engineer for the Siam Electricity Company of Bangkok, Siam, and wife, came all the way from the Orient to attend the final sessions of the Pacific Coast Section, N. E. L. A., at Del Monte. They expect to spend some time in visiting other Pacific Coast points.

J. M. Wadsworth, petroleum engineer of the U. S. Bureau of Mines, with headquarters at San Francisco, has returned from a two months trip to Washington and other Eastern cities, where he has been making fuel tests for the bureau. Mr. Wadsworth will spend a part of his time during the next few months working in co-operation with the Federal Fuel Administration, and will have supervision of the solution of technical questions arising in connection with the burning of fuel oils.

E. W. Wagy, petroleum technologist of the Bureau of Mines, with headquarters at San Francisco, spent the months of March and April in Colorado and the mid-continent fields, co-operating with state officials in making investigations of the conditions of the wells in the Boulder field in an effort to ascertain if the production of this field could be revived. He also visited the mid-continent fields with particular reference to the different methods used for drilling; and assisted in an advisory capacity in water problems of the Eldorado, Kansas, field.

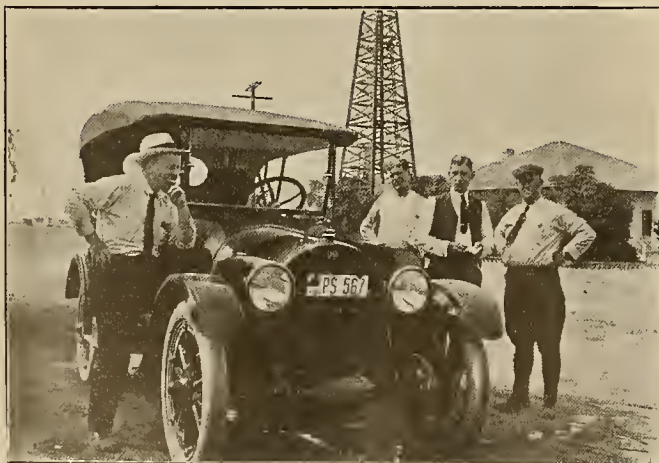
C. L. Cory, professor of electrical engineering at the University of California, has returned to Washington, D. C., to resume his duties as assistant director in the division of power supply for the U. S. Government Explosive Plants, a position to which he was appointed by D. C. Jackling in March. A power supply for the great smokeless powder plant near Charlestown, West Virginia, is to be secured by interconnecting the Virginia Power Company, Appalachian Power Company, and possibly the Logan Power Company, thus also liberating smokeless coal for navy use.

M. L. Requa, Fuel Oil Administrator, still hopes to bring about an agreement on the fuel oil situation. The Navy Department wants to have a large portion of the oil produced put into storage for future use, or to secure an agreement from the oil industry to deliver in the future quantities as needed. Oil producers, according to Percy T. Morgan, vice-president of the General Petroleum Company, are willing to meet the Navy in the future delivery requirements in part, but doubt the practicability of doing so completely. The oil men say the petroleum production of California has dropped from 100,000,000 barrels annually to 90,000,000 barrels and that the only source of quick additional production is in the naval reserves.

Charles A. Coffin, chairman of the board of directors of the General Electric Company and head of the Franco-American Clearing House in New York, is the only officer of the Legion of Honor in America. This honor came as a complete surprise to Mr. Coffin during a recent dinner. The ex-assistant French War Secretary, Justin Godart, brought with him to this country a special commission from his government to bestow the cross of an officer of the Legion of Honor upon Mr. Coffin. This honor was conferred on Mr. Coffin for his work at the Franco-American Clearing House, which is now under the direction of the Red Cross, and for his efforts to develop a system of scholarships for Americans in French universities. Mr. Coffin succeeded Judge Robert S. Lovett as the head of the Committee of Co-operation appointed by the Red Cross to negotiate with independent war relief organizations. As head of the executive committee of the War Relief Clearing House he has been very much interested and active in war service.

OBITUARY

Frank E. Getts, general manager of the Electrical Engineers' Equipment Company of Chicago, Ill., died suddenly of heart failure in Los Angeles, May 9, 1918. Mr. Getts and his wife have both recently made many friends in the Southwest, while on their recent visit. His sudden passing comes as a great shock to men of the industry the nation over.



& Power Company, have recently enjoyed a pleasant inspection of the oil fields at Lost Hills, California. These men of the industry are shown in the picture in the order named, from left to right.

MEETING NOTICES FOR ELECTRICAL MEN

(The union of the various engineering societies for the purpose of common service is one of the features of the present situation. Annual meetings of the national societies are reported with springtime regularity. In the local groups, many interesting meeting have taken place, but the greatest energy has been put in the past two weeks into the Red Cross Drive.—The Editor.)

Joint Meeting Associated Engineering Societies of Seattle

A joint meeting of the engineering societies of Seattle was held Tuesday, May 21st, at the Chamber of Commerce Hall, Arctic Building, at 8 p. m. The program as furnished by the Seattle Section, American Institute of Electrical Engineers, consisted of a paper on "The Work of the Bureau of Standards" by E. R. Shepard, associate electrical engineer, Department of Commerce, Bureau of Standards.

So many members of the several societies in the association have been called into active service of the United States for the period of the war that it is considered difficult for any one society to secure the advantage of a reasonably large attendance at regular meetings. On this account the council of directors and officers of the constituent societies have decided to hold joint meetings for the consideration of programs which will be provided by the various societies in turn. In this way, the scientific and social value of all meetings will be greatly increased.

When desired by any constituent society, a few minutes will be devoted to the transaction of any business of immediate importance. The following societies are included: Pacific Northwest Society of Engineers, American Society of Civil Engineers, American Institute of Mining Engineers, American Institute of Electrical Engineers, American Chemical Society, and Washington Association of Engineers.

The Engineers' Club of San Francisco

The board of directors of the Engineers' Club have for some months been considering means of enlarging the usefulness and increasing the membership of the club with the special end in view of securing the interest and support of the young men of the profession upon whom the future success of the club will depend.

A special meeting was held at the club on May 28, 1918, to vote on sundry proposed amendments to the By-laws, which the directors recommend as necessary to accomplish these ends.

The San Francisco Electrical Development League

The meeting of the San Francisco Electrical Development League for May 15, 1918, was largely given over to an "echo program" of the Del Monte conventions, in which the helpful features of that great series of gatherings were rehearsed and fixed in mind for the work ahead during the coming year. Paul Carroll, formerly in charge of publicity for the San Francisco Chamber of Commerce, exhibited a beautiful series of views he recently collected on a tour of China and Chosen.

No meeting was held on May 22d, as so many of the

league members were actively engaged in putting over the second Red Cross War Drive.

Jovian Electric League

At the meeting of the Jovian Electric League of Los Angeles, held May 22d, Edgar J. Rose, electrical engineer, gave a most interesting and thrilling demonstration of high tension and high frequency electricity. R. C. Hill, manager of the Empire Electric Company, acted as chairman of the day.

San Francisco Section, A. I. E. E.

At the meeting of the San Francisco Section, A. I. E. E., on Friday, May 24th, at the Engineers' Club, the following subjects were presented:

1. "War Flying from Engineering Standpoint," by Lieut. William S. Leffler, Reserve Aviator, U. S. Army Air Service.

2. "Electro Chemistry and the Power Industry," by J. W. Beckman.

This was the last meeting of the season.

Engineering Council

The Engineering Council is an organization of national technical societies of America, created to provide for consideration of matters of common concern to engineers, as well as those of public welfare in which the profession is interested, in order that united action may be made possible.

The work of the committees represented under this council may be given as follows:

Public Affairs Committee reports on matters of public policy and those relating to national, state and local governments other than engineering and scientific technical questions.

American Engineering Service has extensive classified lists of technically trained engineers in all parts of the country, from which thousands of names have already been furnished to the government and to others for military and civilian engagement;

is prepared to supply names civil, mechanical, electrical, mining, metallurgical, automotive, aeronautical, chemical, refrigerating, heating and ventilating and other professional engineers and assistants.

War Committee of Technical Societies is officially connected with Naval Consulting Board and War Department; engaged upon examination of new inventions and similar work for the government.

Fuel Conservation Committee is connected with Bureau of Mines and Fuel Administrator, studying and advising on problems of fuel utilization, especially coal.

Patents Committee has been organized to investigate reforms in United States patent system and in use of experts in litigation wherein validity of patents or other technical matters are involved. It will co-operate with similar committees of National Research Council and other technical societies.

Military Aid Committee will care for matters of common concern to engineers in uniformed and civilian service of government in connection with the war, during both wartime and the period of reconstruction.

Water Conservation Committee has been created to deal broadly with questions concerning utilization and control of water in all parts of the country for municipal supply, power development, navigation, irrigation, sewage disposal, flood control and other purposes; to promote such consideration of water resources by congress and legislatures as will result in conservation rather than unintelligent appropriation to a narrow use at the expense of some more important use, also to encourage wise development.

Publicity Committee will aid the secretary in collecting information of interest to Engineering Council and in discovering and utilizing suitable means of publicity.

BUILDERS OF THE WEST—XXX



CHARLES MILLS GAYLEY

Born in Shanghai, China, a graduate of the University of Michigan, and for a quarter of a century noted on two continents as author and lecturer on "Great Books," Charles Mills Gayley, dean of the faculties at the University of California, is today rendering service to the nation to a degree that few have the privilege to attain. His former students by the hundreds are now upon the seas, in the trenches, and—eagle-like—masters of the air; and today, this eloquent voice, in behalf of the allied cause, is being heard in hamlet, village and metropolitan life of the West. To you, Charles Mills Gayley, this issue of the Journal of Electricity is dedicated. And with this dedication goes the loving hope that results may be attained in still further arousing our nation in a manner in full keeping with the wonderful firmness and sincerity of your plea.

The American Society of Mechanical Engineers

The spring meeting will be held this year at Worcester, Mass., June 4 to 7, with headquarters at the Hotel Bancroft. Professional sessions will be held both at the hotel and at the Worcester Polytechnic Institute, and will largely relate to questions with which engineers are now having to deal in connection with the war.

The annual meeting papers for the December, 1918, meeting should be in the hands of the secretary by September 20. Papers are solicited for this meeting, and for any of the meetings held by the 22 local sections in different cities throughout the country. Brief contributions of less formal character are also desired, containing notes of experience, results of investigations, accounts of new work, engineering data, discussion of society affairs, etc.

Alameda County Electrical Club

The Alameda County Electrical Club held its regular monthly meeting in the Commercial Club Rooms of the Hotel Oakland, Monday, May 20th.

The meeting was very well attended and both James MacLafferty and Rev. Price gave very interesting talks—the former having for his subject "German Propaganda," and the latter, "The Red Cross." Both talks were well applauded.

President George Drew wishes to announce that the meeting day has been changed from Thursday to Monday, and the next meeting will be held on June 17th.

Colonel Carty Receives Edison Medal

Dr. John J. Carty, colonel in the United States Army Signal Corps and chief engineer of the American Telephone & Telegraph Company, has been awarded the Edison medal in recognition of his services in developing the science and art of telephone engineering.

The medal was presented on Friday evening, May 17th, at the annual meeting of the American Institute of Electrical Engineers in the Engineering Societies Building in West 39th street, New York. Colonel Carty is the eighth American scientist to be honored in this way, the others being Elihu Thomson, Frank J. Sprague, George Westinghouse, William Stanley, Charles F. Brush, Alexander Graham Bell, and Nikola Tesla.

The Edison gold medal was founded in 1904 by the Edison Medal Association, an organization composed of old associates and friends of Thomas A. Edison. It is awarded annually by a committee of 24 members of the American Institute of Electrical Engineers, and was first awarded in 1909, the recipient being Elihu Thomson.

A GRAND "SYNERGISTIC" RALLY AHEAD

So enthusiastic proved the recent rally of the California Electrical Co-operative Campaign held in Los Angeles, as recounted at some length in the Journal of Electricity for April 1, 1918, that the advisory committee have set the evening of June 7, 1918, at 7 o'clock in the Commercial Club rooms in San Francisco, as an occasion for a similar gathering in northern California. S. M. Kennedy, general agent of the Southern California Edison Company, now famous as the inventor of the word "synergism" at the Los Angeles meeting, has been asked to journey northward for this occasion. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been asked to act as toastmaster. Other noted speakers who have been asked for this enthusiastic meeting are Samuel Kahn, general manager of the Western States Gas & Electric Company and the newly elected president of the Pacific Section, N. E. L. A.; L. H. Newbert, manager of the commercial department, Pacific Gas & Electric Company and chairman of the advisory board; H. C. Reid, president of the California Association of Electrical Contractors and Dealers; Albert Elliot, secretary of the Pacific Division of the National Electric Supply Jobbers Association; and Max Thelen, president of the California Railroad Commission. The occasion is to be one long to be remembered. Put it down in your note book at once. The price is but \$1.50 per plate. Don't fail to lend your presence to this one great event of the season.

The purpose of this meeting is to forward co-operative helpfulness among all branches of the industry. Urge all your engineering acquaintances, contractor-dealers, and electrical men of every walk of life to be present. No special invitation is necessary. Every one interested in any way in affairs electrical will be welcome.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Plitcock Block, Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.

San Francisco Section—

Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.

Secretary—Allen G. Jones, Rialto Bldg., San Francisco.

Meetings—Fourth Friday each month—Engineers' Club, 7 p. m.

May 24th—"War Flying From an Engineering Standpoint," by Lieut. W. S. Leffler; "Electro Chemistry and the Power Industry," by J. W. Beckman.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.
May 21st—"The Work of the Bureau of Standards," by E. R. Shepard.

Spokane Section

Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock, Assembly Room of Commercial Club, Salt Lake.

Vancouver Section

Chairman—R. F. Hayward, Western Canadian Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. H. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—H. W. Lewis, Stanford University, Cal.
 Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch

Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
 Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
 Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
 Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
 Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—S. E. Stites, 301 Montgomery St., Pullman, Wash.
 Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
 Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS**National Association of Electrical Contractors and Dealers**

Chairman—W. Creighton Peet.
 Secretary—Harry C. Brown, 110 West 40th St., New York.
 Executive Committeeman-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggar, Portland.

British Columbia Ass'n Electrical Contractors and Dealers

President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
 Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
 Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—H. C. Reid, 507 Montgomery St., San Francisco.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—J. M. Carlson, 175 Jessie St., San Francisco.
 Secretary—J. W. Asher, 601 Howard St., San Francisco.
 Meetings—Saturday, 12:15; The States Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
 Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
 Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
 Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Center St., Reno.
 Secretary—R. W. Shearer, 215 Sierra St., Reno.
 Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—A. S. Halls, 262 Stark St., Portland.
 Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
 Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggar-Sroufe Co., Portland.
 Treasurer—J. W. Oberender, 301 Dekum Bldg., Portland.
 Meetings—Saturday, 3 p. m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
 Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
 Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
 Secretary—H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
 Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS**Electrical Supply Jobbers Association**

General Secretary—Franklin Overbargh, 411 So. Clinton St., Chicago, Ill.
 Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Company, San Francisco.
 Secretary—Albert H. Elliot, 544 Market St., San Francisco.
 Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
 Secretary—Albert H. Elliot, 544 Market St., San Francisco.
 Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST**Nevada Section, N. E. L. A.**

Chairman—Geo. A. Campbell, Reno, Nev.

National Electric Light Association

President—J. W. Lieb, N. Y. Edison Co., New York City.
 Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
 Meetings—June.

Pacific Coast Section, N. E. L. A.

President—H. F. Jackson, Holbrook Bldg., San Francisco.
 Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
 Meetings—Annually, in April.

Portland Section, N. E. L. A.

Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
 Secretary—R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society

Meetings—First Tuesday each month.
 President—G. H. Stickney.
 Secretary—Clarence L. Law.
 Western representative—Romaine Myers, Bacon Bldg., Oakland.

New Mexico Electrical Association

President—M. R. Buchanan, Silver City, N. M.
 Secretary—E. M. Haggerson, Silver City, N. M.
 Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—H. C. Morris.
 Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n

President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
 Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.

Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League

President—H. N. Sessions, San Fernando Bldg., Los Angeles.
 Secretary—W. C. McWhinney, Southern California Edison Co.
 Meetings—Every Wednesday, 12 m.
 May 22d—"High Tension and High Frequency Electricity," by E. J. Rose.

San Francisco Electrical Development League

President—R. E. Fisher.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
 Secretary—A. E. Coney, Great Western Power Company, San Francisco.
 Meetings—About every 50 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric Company, Oakland, Cal.
 Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club

Secretary—C. A. Blair, Los Angeles.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section

President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
 Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS**National Officers**

President—Charles T. Main, Engineering Society Bldg., New York City.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.

President—B. F. Raber, University of California, Berkeley.
 Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
 Meetings—Quarterly.
 Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
 Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
 Meetings—Quarterly.

ENGINEERS' CLUBS**Oregon Society of Engineers**

President—Orrin E. Stanley, Box 973, Portland, Ore.
 Secretary—C. J. Hogue, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle

President—J. F. Pinson, Seattle, Wash.
 Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
 Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco

President—B. P. Legare, 58 Sutter St., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.
 Annual meeting: October.
 May 28th—Special meeting.

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.
 Secretary—Ira F. Shaffner, Boise.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento

President—George S. Nickerson, 914 Forum Bldg., Sacramento.
 Secretary—F. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

MISCELLANEOUS**American Ass'n for the Advancement of Science—Pacific Division**

President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
 Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
 Meetings—Annual.

American Chemical Society—Oregon Section

Secretary—Norman C. Thorne.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
 May 22d—"The Inter-relation of Banking and Foreign Trade," by W. D. Wittemore.
 "French Indo China," by F. H. M. Gode.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
 Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
 Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Annual Meeting of the Society for Electrical Development, Inc.

The annual meeting of the Society for Electrical Development, Inc., was held on Tuesday, May 14th, at the offices of the society in New York. At the board of directors' meeting, which followed the annual meeting, with J. E. Montague presiding, it was decided to continue the work of the society for another year upon the present basis and to conduct a "Convenience Outlet" campaign as suggested by the general manager. An appropriation was made to carry on the campaign along national lines, similar to the "Wire Your Home" and "America's Electrical Christmas" campaigns.

Pacific States Electric New Representative of Fibre Conduit Co.

The Pacific States Electric Company have been appointed exclusive sales agents on the Pacific Coast for the Fibre Conduit Company of Orangeburg, N. J. The Fibre Conduit Company has heretofore been represented in this territory by Pierson, Roeding & Co., who recently discontinued their business as manufacturers' sales agents.

New Power Loads

The Eureka Sash & Door Company of Eureka, Cal., has increased its power installation by 50 per cent, securing energy from the Western States Gas & Electric Company. The Western States Company is also installing 40 horsepower additional for the Holmes-Eureka Lumber Co.

The Albany, Ore., division of the Oregon Power Company recently secured orders for 10 electric signs containing a total of 927 lamps, within a one week period.

The Western States Gas & Electric Company, Stockton division, is serving the Sperry Flour Mills with an additional 315 horsepower in motors, making a total power installation for this concern of 453 horsepower. The new power installation will operate at a high load factor and is particularly desirable business from the central station standpoint. The flour company is milling large quantities of flour for export to France.

The Hercules Powder Company has 2500 men engaged in constructing their new plant at Pinole, Cal.

Permits for two hundred new homes have been issued in Tacoma, Wash., since the first of the year. It is expected that permits for 1918 will reach 1000.

Personal Items

J. F. NePage of the electrical engineering and contracting firm of NePage-McKenny Company, Armour Building, Seattle, Wash., recently returned from a trip to California. He reports that the San Francisco office of the company has secured a contract for complete electrical installations in Albers Brothers' flouring mill at Oakland, contract amounting to \$22,000. The company also has a contract for electrical wiring in the elevator being erected at St. John's, Oregon, by the Portland Dock Commission, amounting to about \$41,000.

Will C. Caffray has recently been appointed Pacific Coast manager for the Hart Manufacturing Company, manufacturers of the Diamond H line of push buttons, switches, receptacles and remote control switches. Mr. Caffray will make his headquarters in Los Angeles and carry a complete stock there, but proposes to arrange so that Diamond H material can be obtained from distributors throughout the Pacific Coast district.

New Business

The Denver Gas & Electric Company completed its month's Hoover sweeper campaign on April 20th. The number of machines sold totaled 535 with a value of \$31,489. This was an increase of 25 machines and \$1593 over last fall's campaign. Secretary Clare N. Stannard in wiring the news to New York, stated that he had received a congratulatory

wire from the Hoover company, praising the Denver company as the leader in the sale of Hoover products.

Baker-Joslyn Company, 526 First avenue South, Seattle, has procured a contract from the city for supplying weather-proof and bare copper wire to the extent of \$13,000. Delivery is to be made in five weeks and this was an element favoring the successful bidder.

Liberty Loan Returns

San Joaquin county, Cal., in which the Stockton division of the Western States Gas & Electric Company operates, oversubscribed its quota to the Third Liberty Loan 50 per cent.

Richmond, Cal., doubly subscribed its quota for the Third Liberty Loan, the total running over \$500,000.

Every employee of the Sprague Electric Works of General Electric Company, on May 1, 1918 (1482 men and women) subscribed to the Third Liberty Loan. Their subscriptions aggregated the sum of \$116,850, or an average subscription of \$78.85 from each employee.

"Coal Week" from June 3 to 8

"Coal week," the period from June 3 to 8, has been selected by United States Fuel Administrator Garfield for an intensive and specific drive on the early ordering of coal. The fuel organizations of the various states, the county chairmen of fuel committees throughout the nation, coal dealers, chambers of commerce, mine operators, and others are all called upon to do their utmost to make this week's drive a big success.

Decision Deferred Until After War

The decision in the case of Marconi Wireless Company of America against Kilbourne & Clark Manufacturing Company of Seattle, extensively engaged in the production of wireless apparatus, has been postponed until after the war. The Kilbourne & Clark Company was given a verdict by the United States District Court and the case is now pending in the United States Circuit Court of Appeals. Decision by this court has been postponed at the request of the United States Navy Department. Stipulation that no further action be taken for the present, lest the government's claims be prejudiced, has been signed by counsel for contending interests.

University Organizes Course in Radio Communication

In response to a request from the Signal Corps of the United States Army, the University of California will offer a course in radio communication, beginning May 20, 1918, and extending over a period of from 12 to 15 weeks. The course will be open to students who have had courses in radio telegraphy, electrical or other engineering, or certain courses in physics. Application for admission should be submitted as soon as possible.

Limitation of the Importation of Crude Rubber

As one of the most important steps in its plan for conserving tonnage through the restriction of imports, the War Trade Board, at its meeting on May 7, 1918, directed its bureau of imports to limit the issuance of licenses for the importation of crude rubber from overseas to a total of 25,000 tons from May 6, 1918, to and including July 31, 1918. This restriction will be put into effect immediately by the bureau of imports. The requirements for the production of goods for the United States and allied governments will be met in full. The remainder of the 25,000 tons to be licensed will be allocated among the manufacturers of rubber products on the basis of their consumption during the calendar year of 1917.

All outstanding licenses for the importation of rubber from overseas will be void for ocean shipment as to shipments made from abroad after May 8, 1918.

LATEST IN EVERYTHING ELECTRICAL

(The construction of wooden ships has come to be one of the record achievements of the West. In this connection many new devices and improved methods have been brought forward—none of more importance than the electric dubber described here, which saves the time of many men—and, like most electrical machines, does the work more accurately. An interesting group of other new devices is further described. —The Editor.)

SPEEDING WOODEN SHIP CONSTRUCTION

As the demand for ships becomes more emphatic, new devices are being added to speed their production. This is particularly true in the Pacific Northwest, where the output of tonnage is large and steadily growing from month to month.



The electric dubber

Wooden ships in steadily increasing numbers are being turned out by the yards aside from the steel ship output, which is breaking all records.

An important contribution to the wooden shipbuilding industry is an electric dubber perfected and manufactured by Gray & Barash, electrical engineers and machinists of Seattle. It is claimed for this machine that it will do the work of twenty men with adzes and this result attained by one operator. The United States Shipping Board thinks so well of it that it has already installed it at the plant of the Peninsula Shipbuilding Company of Portland and has ordered another for the

Sloan plant at Anacortes, both of which plants were taken over by the government. The mechanism can do 70 to 80 per cent of the dubbing of a wooden hull and the adz is required on the balance.

Dubbing means fairing the inside and outside of a wooden ship in frame. Before the planking can be placed on the exterior of the hull and the sealing on the inside of the hull, it is necessary to fair the frames so they will have even surfaces. It is otherwise impossible to make the frames so that their surfaces will jibe. The electric dubber planes off the interior and exterior sides of the frames so that a smooth and even surface is presented for the planking and sealing. The work up to now has been done wholly by hand with the adz, which gives a surface 75 per cent fair or even, but the electric dubber gives a surface 100 per cent even and, according to government experts, the process adds 10 per cent to the strength of the hull.

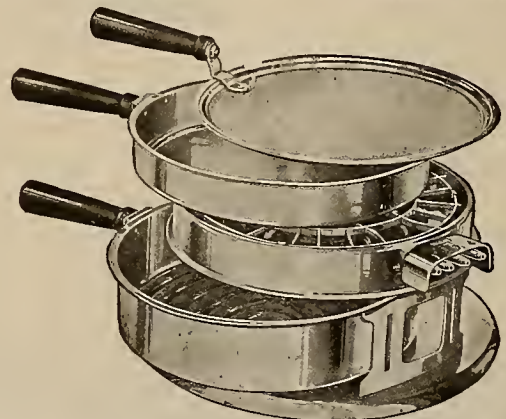
The electric dubber operates on two eight-pound rails, 150 feet of track being provided for it. Rails stand four feet apart and are attached to the frames by lag screws. Six hundred square feet of space is covered without changing the rails.

Adjusting it to the curves of the vessel's hull is but the work of a moment. The carriage runs on the rails, moving forward under pressure of the operator's hand. An eight-inch cutter head in which the knives or planes are set is run by an electric dynamo, the cutter head shaving off the differences in the surfaces of the frames. As a matter of fact it is a portable planer operated by electric energy. The motor utilized is six horsepower, light and of high speed and the record of its operations is the dubbing of 1000 to 1500 square feet in eight hours.

Many plants have placed orders for this mechanism and others have it in operation. Among the plants placing orders are the Granton Iron Works of Noank, Conn.; American Shipbuilding Company of Brunswick, Ga.; Benicia Shipbuilding Company of San Francisco; Grays Harbor Motorship Co. of Aberdeen, Wash.; the McEachern Shipbuilding Company of Portland, and the Meacham & Babcock Shipbuilding Company of Seattle, and others. At Seattle the Elliott Bay Shipbuilding Company and the McAteer Shipbuilding Company have the electric dubber in full operation in their yards. The Tacoma Shipbuilding Company has had one going for several months.

GRILL WITH ALUMINUM PANS

To meet the demand for a grill with rust-proof pans, Landers Frary & Clark have brought out their E986 four heat round grill. This is similar to their regular E984 round grill but has two aluminum pans in place of the regular nickel plated



The aluminum pans may also be purchased separately

steel equipment. Being of solid seamless aluminum, these pans will withstand long boiling and soaking in water without damage and are desirable equipment for round grills. The pans may also be purchased separately.

BRASS SHADE HOLDER

Harvey Hubbell, Inc., have placed on the market a line of brass shade holders of the three-screw type for use with medium and mogul base weatherproof and porcelain sockets.



Shade holder

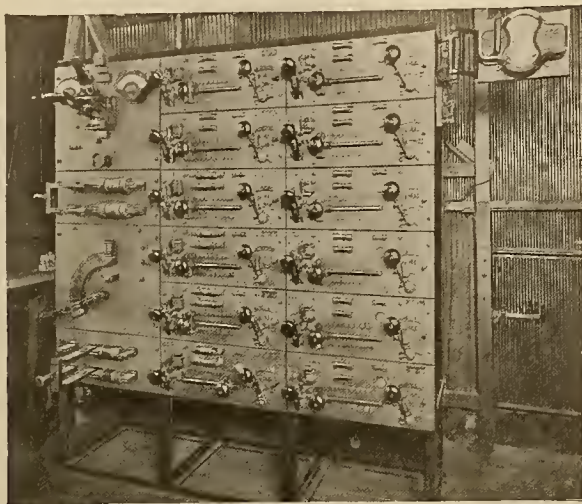
The attachment to the socket is accomplished by means of a clamp and screw arrangement which guarantees a firm grip.

The holders are given a bright dip and lacquered finish, making an attractive as well as useful device.

BATTERY CHARGING INSTALLATIONS FOR INDUSTRIAL TRUCKS

The C-H sectional battery charging equipment for electrical vehicles which has been installed in a number of public and private garages, has also been widely adapted during the past two years for charging batteries of industrial trucks. The accompanying illustrations show typical installations of this equipment. The smaller equipment is a standard six section panel recently installed in the plant of Johnson & Johnson at

New Brunswick, N. J. One of their electric trucks which is partially shown in the illustration, is being charged from the third section from the top. The larger equipment is twelve circuit board consisting of two standard six section panels. The left hand panel is of the same dimensions but is equipped with control equipment for the operation of a motor-generator set supplying direct current to the charging sections. These charging panels are built much like the present day efficient



Twelve section panel with motor-generator panel on left used to charge industrial trucks at Pier No. 49, North River, New York City, Southern Pacific Railroad.

sectional bookcase. Each section has a grid resistance mounted on the back of the slate and control switches, fuses and slider rheostat head on the front. Each section is a complete self-contained unit providing everything necessary for the proper charging and protection of the battery. A standard panel, like the one shown, will hold from one to six sections and where more than six sections are required two or more panels can be bolted together. The dimensions of the sections and panels are standardized, hence future space requirements can easily be figured. The back of each panel is provided with vertical bus bars which are furnished with copper lugs for



Standard six section panel at plant of Johnson & Johnson, New Brunswick, N. J.

making connection to the supply wires. Two lugs are also provided on each section to which the battery leads are connected.

As alternating current is used throughout the plant of Johnson & Johnson, a motor-generator set, consisting of an alternating current motor and direct current generator, was installed to supply direct current for battery charging. The twelve circuit panel is installed on Pier No. 49 North River, New York City, owned by the Southern Pacific Railroad. This transportation company also owns and operates a number of steamships. At Pier No. 49 they now have a total of 21 industrial trucks in service. These trucks are used to carry material in and out of ships, working directly from boat to pier and thence to barges or conveyances nearby. The freight handled consists mostly of copper in pigs, molasses, resin and sugar in barrels, cotton in bales and other similar material. The trucks are also used as tractors to draw a number of trailers about the unloading pier. This company had but 12 trucks when the charging equipment was installed; since then they purchased additional trucks from time to time until now they have a total of 21. They are charged at night by filling the hoard to its capacity of 12 trucks and then replacing each truck as its battery comes up to full charge. In two years under this severe service, not one part of the charging boards has been replaced.

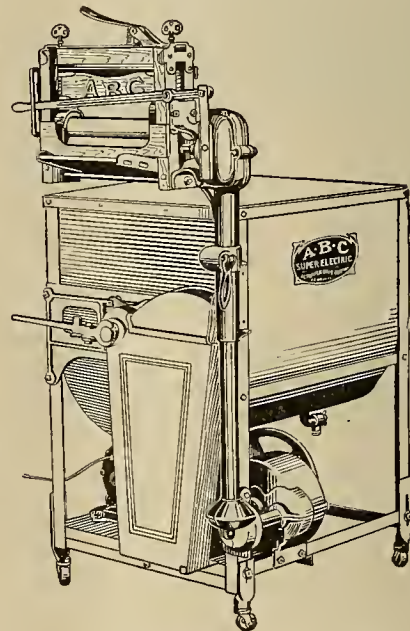
Both of the charging equipments described above were furnished by the Cutler-Hammer Mfg. Co., of Milwaukee and New York.

NEW A. B. C. ELECTRIC WASHER

A new washer of the revolving cylinder type has been developed by Altorfer Bros. Co., Peoria, Ill.

This washer, known as the A. B. C. Super-Electric, is made of metal throughout with the exception of the wringer frame and the revolving cylinder.

The cylinder is built of 2-inch wood staves spaced a quarter of an inch apart and perforated with half-inch holes, affording ample openings for the passage of the water through the clothes. A lid which locks tightly when the washer is in operation, is provided in the cylinder for inserting the clothes and removing them from the rotating



A revolving cylinder type washer

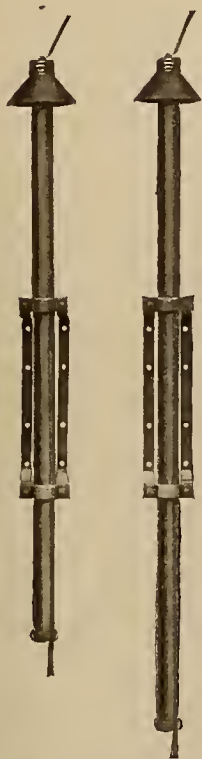
cylinder. The cylinder makes a complete revolution in one direction and then reverses.

The wringer is supported by an upright arm extending from one corner of the washer. It is provided with a safety release which enables the operator to stop the rolls immediately if they get choked or overloaded, simply by pressing the lever on top of the wringer. The wringer will swing to any position and can be locked in any desired position.

The power is transmitted both to the wringer and washer by shaft drive. All gears are machine cut and run in oil. They are encased in metal shields. A $\frac{1}{4}$ horsepower Robbins & Myers splash-proof motor is used to drive the washer and is mounted on a cross piece between the leg braces.

A COMPRESSION CHAMBER ARRESTER FOR 10,000 AND 13,200 VOLT CIRCUITS

To protect pole transformers on 10,000 and 13,200 volt distributing lines, the General Electric Company has developed a unique form of compression chamber, multigap lightning arrester in which is embodied the shunt resistance principles (Fig. 1).



Compression Chamber Lightning Arrester for 6600, 11,000 and 13,200 volt service—Fig. 1

In the usual form of multigap shunt resistance arrester, the resistances shunt the gaps. In this form, the gaps shunt the resistances. The gaps are mounted on and insulated from the resistance rods. The arrangement of the gaps and resistances is shown in Fig. 2 and in Fig. 3.

Sensitiveness to lightning disturbances is obtained by this combination of gaps and resistance rods used as shunts, all mounted in a porcelain tube.

By reason of this combination of gaps and resistances, the arrester will discharge at low rises in potential, is sensitive to lightning over a wide range of frequency, and following the lightning discharge, quickly cuts off the generator current and prevents "grounds" or "shorts."

charge takes after passing through the series gaps depends on the frequency and quantity. Very high frequency will discharge straight across all the gaps. Discharges of lower frequency will take place through one of the shunt paths. The generator current which follows the lightning discharge will shunt to the resistance rods. This limits it to an amount that can be extinguished readily by the gaps.

A NEW SAFETY SWITCH

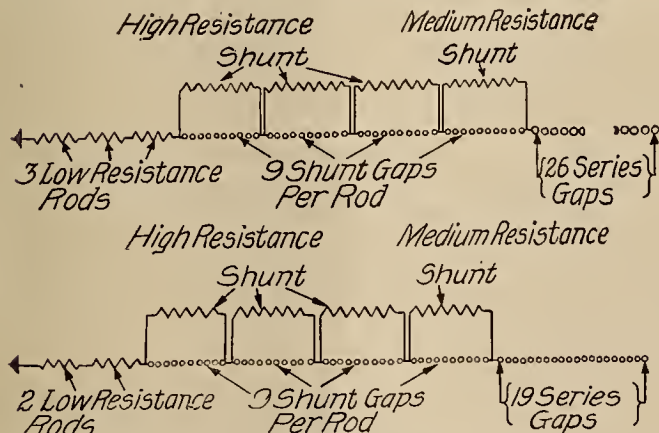
The Square D Company, Detroit, Michigan, steel enclosed switch manufacturers, call attention to some of the very important features of their Square D safety switches, which are made under National Electrical Code specifications and are approved by the Underwriters' Laboratories, for both fire and accident prevention.



Square D safety switch

The switch is of very simple construction, completely enclosed in a sheet steel box so designed that ample wiring space is provided inside to make the necessary connections, and the corners of which are electrically welded, thus assuring great durability. The box is provided with a hinged cover, held closed with a simple spring, and the switch is operated by a crank handle located on the outside. Raised letters on the box indicate the "on" and "off" position of the switch.

The switch may be locked in the "off" position to prevent accidents while repairs are being made on apparatus controlled by it, provision being made for three individual padlocks. The advantages of these are obvious where there is more than one man working on the line or equipment. When each man starts to work he locks the switch in the "off" position. This eliminates the possibility of either man throwing the switch "on" before all are finished working. Means are



LIGHTNING ARRESTERS—FIG. 2

For outdoor service of 7500-11,900 volts and 11,900 to 15,000 volts, respectively

gap is grounded through the other resistances, the initial discharge is made easy, because the ground potential is brought up to the bottom of the series gaps. The path which the dis-

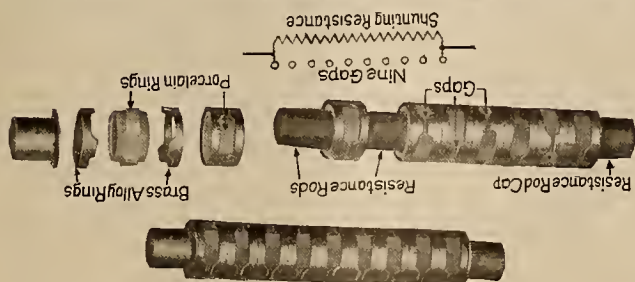


The electrician has access at all times

also provided to seal or lock the cover shut to prevent unauthorized persons over-fusing the switch or tampering with live connections in any way, but the electrician has access to it at all times and can make his tests or inspection without stopping the motor or delaying production.

The switch is provided with a quick-break mechanism which is absolutely positive and insures a simultaneous break at all blades. This positive action makes longevity of the copper blades and the switch jaws a certainty.

Another feature is the interchangeability of end plates, which are furnished blank, with knock-outs, or with porcelain outlet covers for open wiring according to installation requirements.



Shunted resistance units used with Compression Chamber Arrester—Fig. 3

NEW ELECTRICAL DEVELOPMENTS

(A city owned hydraulic plant is proposed for Walla Walla, and an ordinance for the issuance of four million dollars in bonds for the purchase of a power site has been introduced in Portland. The Northwest Electric Company is already building a \$250,000 power plant in that city. At least one large hydro-electric project is planned in the Pacific Central District, and several improvements and extensions of transmission lines which are of importance.—The Editor.)

THE PACIFIC NORTHWEST

GOLD HILL, ORE.—The city has decided to equip the McClure power plant on Rogue River for municipal light and water uses.

NORTH VANCOUVER, B. C.—The city council is considering an option on the property of the Nairn Falls Power Company with a view of developing hydro-electric power.

PORTLAND, ORE.—The Northwestern Electric Company is to erect a \$250,000 power plant at the foot of Lincoln street. Charles C. Moore & Company are engineers on the job.

EPHRATE, WASH.—The Ruff Lighting Company has asked for a franchise to construct, maintain and operate a transmission line for light and power over certain county roads.

PORTLAND, ORE.—An ordinance has been introduced to the city council providing for an issue of \$4,000,000 for the purchase of a large tract of land as a site for a new power plant.

OLYMPIA, WASH.—Application has been filed with the state engineer by P. C. Kaylor for 9000 second feet of water from the Spokane River, to be used for hydro-electric development.

SEATTLE, WASH.—The Baring Granite Company, with offices in the Downs Building, Seattle, contemplates installation of a 200 horsepower hydro-electric plant at its plant near Baring, Wash.

KLAMATH FALLS, ORE.—The public service commission at Salem has rendered a decision that the Keno Power Company may secure a franchise and operate in the Klamath Falls country.

BELLINGHAM, WASH.—At a cost of several thousand dollars a power plant is to be erected by the Boundary Red Mountain Mine this summer to take the place of one destroyed by fire.

SEATTLE, WASH.—A bill granting a franchise to the National District Telegraph Company to install a signal alarm system in the city has been passed by the council over the veto of the mayor.

SEATTLE, WASH.—Equipment is being installed by the Coast Engine Company of Seattle for the manufacture of small electric lighting plants to be operated by heavy oil engines of 2½ horsepower.

EVERETT, WASH.—The city council has engaged Burns & McDonnell of Kansas City, Mo., to make investigations and prepare estimates of the cost of establishing a power plant in the upper Sultana River district.

SEATTLE, WASH.—The \$30,000 concrete power station to be built by the Stone-Webster Company for the Puget Sound Traction, Light & Power Company is to be constructed at once at 6500 Fourteenth avenue S.

WHITE ROCK, B. C.—Arrangements have been made by the local water works company with the British Columbia Electric Railway, Power & Light Company to equip the local pumping station for electric operation.

EVERETT, WASH.—The United Steel Company, which is to install an electric furnace along with other equipment in its new plant, will also install two large magnets to be operated electrically for handling scrap.

WENATCHEE, WASH.—Application has been filed by the Chelan Falls Power Company with the county commission-

ers of Douglas county for the right to construct and operate electric transmission lines over certain sections of the county.

LAKEVIEW, ORE.—Contracts have been signed with the Goose Lake Valley Irrigation Company for water covering about 10,000 acres for the present season. Seven thousand acres are known as the Hunter lands, while the remainder are lands in private ownership scattered throughout the valley.

CLOVERDALE, B. C.—Contract was recently signed by officials of the Whitlock Waterworks, Ltd., with the B. C. and E. R. Company for extension of power and light transmission line to the waterworks pumping station. Plans are under way for transforming the plant from gasoline to electric motive power.

CHEHALIS, WASH.—The Valley Development Company of Portland, Ore., has applied to the state hydraulic engineer for a permit to divert the public waters of Lake Creek, tributary to Cowlitz River, in an amount of 105 second feet for the purpose of development of electric power for lighting cities for domestic purposes.

SALEM, ORE.—John R. Lewis, state engineer, has been advised that the Federal government has withdrawn several thousand acres of public lands suitable for water power developments from the Oregon-California Railroad grant acreage. About 100 townships are affected along the Nehalem, Umpqua, Siuslaw, Siletz, Rogue and Smith Rivers and their tributaries.

SALEM, ORE.—Articles showing a decrease in the capital stock of the Portland Railway, Light & Power Company from \$40,000,000 to \$35,000,000, were filed at the office of State Corporation Commissioner H. J. Schulderman. The stock is divided into 350,000 shares at \$100 a share and represents \$5,000,000 in first preferred stock, \$5,000,000 in second preferred stock, and \$25,000,000 in common stock.

PORTLAND, ORE.—Application has been filed by the Valley Development Company of Portland with the state engineer for a permit to divert waters of Lake Creek, Clear Fork, Johnson Creek, and Glacier Creek, for the purpose of generating electricity for transmission to cities and towns for manufacturing, mining and domestic purposes. The company has also asked for permission to construct a reservoir in Lake Creek and Clear Fork.

SPOKANE, WASH.—The installation of a flume, penstock, power plant and compressor for the Falls Creek Mining Company, on Pend d'Oreille lake has been authorized by W. C. Ames of Sandpoint, Idaho, president and general manager, according to Oscar Nordquist, mill contractor. The change in the plan of supplying power was made necessary by the expense of hauling gasoline. The flume will be a mile in length. The penstock will be 900 feet in length and provide a fall of 260 feet. The power plant will drive the mill and a compressor of four-drill capacity. The mill will not be operated during the period of construction and installation, but the tunnel will be advanced.

WALLA WALLA, WASH.—What may be the first step toward the city building and operating a hydro-electric plant to be used in connection with the city's water system was taken by the city commissioners at a recent meeting when a survey of Mill Creek between the intake and Tiger Canyon was ordered during the coming low water season. It was also ordered that a survey of the hillside on the south side of

the creek be made to ascertain the grade between the Tiger Canyon and the intake. The city commissioners feel that radical steps will have to be taken some time in the near future to supply the city with a better quality of water during the winter and early spring months when Mill Creek becomes exceedingly muddy.

PACIFIC CENTRAL DISTRICT

BERKELEY, CAL.—The city council is advertising for bids for a lighting system for certain streets and public buildings of the city.

GRIDLEY, CAL.—Rosenberg Bros. & Company have ordered an entire new power plant of 40 per cent more capacity for their rice mill here.

SALINAS, CAL.—The board of supervisors have given permission to the government to build a telephone line from Point Sur Lighthouse to Carmel-by-the-Sea.

SAN FRANCISCO, CAL.—The board of public works is receiving bids for furnishing the electric storage battery locomotives for use in connection with the aqueduct work of the mountain division.

OROVILLE, CAL.—Negotiations are under way between the Federal government and the Great Western Power Company of San Francisco for the construction of their hydro-electric plant to cost about \$5,000,000.

CORNING, CAL.—E. J. Welch, representing the Northern California Power Company, has submitted a proposition to the trustees for a modern lighting system for the city. This was taken under consideration for future action.

WILLOWS, CAL.—An election was held in the Princeton-Codora-Glenn Irrigation District to decide the question of issuing and selling bonds in the sum of \$175,000 with which to finance construction of the Princeton-Codora-Glenn Irrigation District.

OROVILLE, CAL.—During the past year the acreage contracting for water under the Western Canal has been more than doubled, according to Superintendent J. H. Hornung. This year over 14,000 acres will be irrigated by Western Canal waters.

SAN FRANCISCO, CAL.—Engineer E. V. Colby, 333 Grant avenue, is taking figures for a six-story class A building, to be erected for the Pacific Telephone & Telegraph Company on Franklin street, between Seventeenth and Eighteenth, Oakland.

SAN FRANCISCO, CAL.—Recommendation will be made by the supervisors' public utilities committee next Monday that the city co-operate with the Federal Government in building an extension of the Municipal Railway system to the end of the Hunters' Point boulevard.

REDLANDS, CAL.—A stock company will be formed for the manufacture on a large scale of the electrical appliances and linemen's tools invented by H. B. Bush, of this city, and which have been manufactured here and sold to the big electrical companies all over the country.

SAN FRANCISCO, CAL.—The Department of the Interior, Office of Indian Affairs, Washington, D. C., is asking for proposals for the installation of an electric lighting plant at the Southern Ute School, Colorado. Plans may be examined at the United States Indian Warehouse, San Francisco.

PORTERVILLE, CAL.—For the first time since its completion the Terra Bella irrigation district plant, built at a cost of more than \$1,000,000, is serving water to members of the district association along all its main canals. Over 500 inches of water is being delivered to the users. In view of the ample supply of water, a number of large development projects will soon be under way in the Deer Creek district south of here.

STRATHMORE, CAL.—With the completion of the substation at Strathmore, the San Joaquin Light & Power Corporation will receive energy from the plants of the Mount Whitney Power Company and the Southern California Company. The companies affected by the tie-in at Strathmore are the Mount Whitney Power & Electric, the San Joaquin

Light & Power, the Southern California Edison and the San Diego Consolidated Gas & Electric Companies.

REDDING, CAL.—The California-Oregon Power Company will build a high tension line from its southern terminus at Castella to Kennett at a cost of \$330,000, and furnish power to the Mammoth mine and smelter for a minimum of \$105,000 a year. The Northern California Power Company will reinforce its line from the Coleman power house to Hamilton at a cost of \$110,000 and deliver power to Colusa for \$240,000 a year to the Pacific Gas & Electric. Improvements to be made by the three companies will cost \$3,000,000.

WOODLAND, CAL.—Arrangements have been completed between the Food Administration and the Yolo Lake and Power Company and the public interests of Lake county, whereby water from Clear Lake will be available for irrigating this season about 12,000 acres of rice land in Yolo county, which land, it is estimated, will yield a crop of approximately half a million sacks of rice. To complete the contemplated irrigation system it will be necessary to reduce the water of the lake three feet below its minimum level, that is to say, three feet below the zero point on the power company's Rumsey gage.

PITTSBURG, CAL.—Wealthy farmers of this section are developing plans for an irrigation system for this district that will take in the country as far west as Bay Point. Engineers have been making preliminary surveys and it is their opinion that the project is feasible and could be put in at such a cost that it would not be a burden on the land owners, and at the same time would assure them abundant crops yearly, whereas, under the present system of dry farming they only secure a crop every two or three years. The plan is to establish a pumping plant on the San Joaquin River, at what is known as Fuller's Point, and then bring the water to the edge of the foothills, where it would enter the proposed canals and carry it along to Bay Point.

MARICOPA, CAL.—W. H. Cooley, superintendent of the Side Hill Oil Company, has just completed the erection of a derrick for the drilling of the company's first well on the 80 acres of land recently purchased from the Midway Oil Company and located on section 34, 12-24. Work on setting up a thirty-five horsepower boiler has been started and is being rushed to completion for the purpose of furnishing power for the drilling of the well. A contract for electrical power has been entered into with the San Joaquin Light & Power Corporation to furnish electricity for drilling, as well as for the pumping of all wells to be drilled on the property. On account of the company lacking equipment at this time the extension of the lines to the Side Hill lease cannot be made at once and the steam boiler will be used until the electricity can be brought in.

THE PACIFIC SOUTHWEST

YUMA, ARIZ.—The Yuma Gas, Light & Power Company has begun work on the installation of a new transformer at its local substation.

SAN DIEGO, CAL.—A petition applying for the formation of a Public Highway Lighting District has been filed with the clerk of the board of supervisors.

PASADENA, CAL.—The city purchasing agent has been authorized to buy a gas engine for the light department, and electrical apparatus for the fire department.

LOS ANGELES, CAL.—The board of supervisors have granted the Economic Gas Company the right to lay gas pipes in certain public highways of Los Angeles county.

NOGALES, ARIZ.—The Arizona Gas & Electric Company has closed a contract for the wiring of the new Dumarert building on Morley avenue. The company will put in all wiring, install motors, etc.

LOS ANGELES, CAL.—Franchise for an electric distributing and transmission system has been awarded to the Southern California Edison Company for the sum of \$4000 by the board of supervisors.

LOS ANGELES, CAL.—The board of supervisors have granted a franchise to the Midway Gas Company, giving them the right to lay and maintain gas pipes in certain public highways of Los Angeles county.

LOS ANGELES, CAL.—Plans are being considered by the city council for the installation of an electric lighting system in Fifty-fifth street, from Budlong to Normandie avenue. It is proposed to use marbelite standards.

SANTA FE, N. M.—The Andrews Telephone Company of Balinger, Texas, has written to the state corporation commission for permission to run a toll line into Eunice, N. M. The commission is to investigate the situation.

SANTA BARBARA, CAL.—A movement will be started in the near future to have ornamental lights installed on Anapamu street, from State street to Anacapa. The present poles and overhead wires will be removed and carried by a conduit.

PASADENA, CAL.—The city clerk is advertising for bids for one Edison storage battery complete with electrolite and to consist of 60 A-6 cells. The successful bidder will be required to take, in exchange, one 6-p A-6 cell Edison storage battery.

LOS ANGELES, CAL.—Bids are being received by the board of public service commissioners for 100 primary transformer fuse boxes or cut-outs suitable for at least 4400 volts, all to be of the same size and for the approximate range of from 5 to 60 amperes.

LOS ANGELES, CAL.—It is stated by William Mulholland, chief engineer of the water department, that four of the pumping plants are to be operated electrically. The plants to be changed to electrical power operation are the ones at Wilmington, Edendale and Garvanza.

ONTARIO, CAL.—Plans for the immediate erection of a new power house by the Ontario Power Company, at a cost of \$60,000 have been endorsed at a meeting of stockholders of the San Antonio Water Company. The new plant will be located near Hog's Back in San Antonio canyon. It is hoped to have it ready for operation by January 1, 1919.

HOLLYWOOD, CAL.—The board of trade reports that the improvement of Franklin avenue will now be completed through an action of the city council granting permission to the Pacific Electric Railway Company to install T rails with concrete base, instead of girder rails, required by the city ordinance.

ONTARIO, CAL.—Plans for erection at once of a new power house by the Ontario Power Company at a cost of \$60,000 have been endorsed at a meeting of stockholders of the San Antonio Water Company. The new plant will be located about Hog's Back in San Antonio canyon. It is hoped to have it ready for operation by January 1st next.

LOS ANGELES, CAL.—Plans for the construction of an electric railway line between Redondo Beach and Torrance, for connection with the shipbuilding plants at San Pedro, have been outlined by acting Mayor Cullen of Redondo. The proposed railroad will be single-track, perhaps four miles in length, and will cost in the neighborhood of \$100,000.

SNOWFLAKE, ARIZ.—Contract has been awarded by the Snowflake and Taylor Irrigation Company for the installation of an electric light and power plant. As yet none of the equipment has been installed. The company contemplates beginning work on the construction of a hydro-electric plant about July 8. H. T. Lloyd of Wickenburg has the contract.

LOS ANGELES, CAL.—Notice of proposed sale of franchise for a street car line through the proposed Second street tunnel has been transmitted to the city council and referred to the public utilities committee for recommendation. The franchise will be for a street railway from First and Fremont streets, south on Fremont to Second street, and east on Second through the tunnel, to the junction of Broadway and Second street.

OCEANSIDE, CAL.—The work of establishing the San Diego Consolidated Gas & Electric Company in new quarters at Tremont and Third streets is going forward rapidly. Foun-

dations for two 70-ton transformers have been completed and arrangements made for installation of large lightning arrester and other apparatus, so that when completed the plant will be capable of caring for the entire section adjoining Oceanside.

LAMANDA PARK, CAL. — An extension of tentative boundaries of a proposed county lighting district has been made by the lighting committee. A tentative boundary line now extends from Pasadena city limits on the west to the east on both north and south sides of Colorado street. A mass meeting will be held soon for the purpose of getting expression from the people on the question. Some property owners favor annexation by Pasadena and extension of the Pasadena lighting system, and others favor a system of ornamental lights instead of wooden poles that are proposed.

THE INTER-MOUNTAIN DISTRICT

MALTA, MONT.—The new electric lighting system will soon be placed in operation in Malta.

GREAT FALLS, MONT.—The Montana Electric Company has been granted a permit to erect a \$10,000 brick warehouse.

ARCO, IDAHO—At an election held recently the proposal to issue \$10,000 for the installation of an electric light and power plant was defeated.

GRANGEVILLE, IDAHO—Rice & Harness have purchased a lighting system for their ranch below Whitebird from W. S. Hunter. Ralph Mussel has purchased an outfit of the same make for his ranch.

WELLSVILLE, UTAH—Wellsville City Irrigation Company has been incorporated here with a capital stock of \$4140, by Geo. Haslam, D. H. Maughan, W. J. Allen, R. A. Leishman, H. C. Parker, H. L. Maughan and F. O. Gunnell.

MILFORD, UTAH—Preparations are being made for development of the sulphur mine northeast of Milford, on the Beaver-Millard county line, and among other things Superintendent Diehl of the Beaver River Power Company expects to build a line to the mine.

SALT LAKE, UTAH—Preliminary work on plans for the new car barns for the Bamberger Electric Company is under way, according to an announcement made by Julian Bamberger, president of the company. It has not been decided as yet whether the new barns will be constructed in Salt Lake or Ogden, but the question will be settled before the plans for the barns are completed. Difficulty in getting equipment to replace the cars and motors that were destroyed by fire is being encountered, but the company is making efforts to secure new rolling stock to replace that which was destroyed.

SEATTLE SEEKS DEVELOPMENT OF SKAGIT RIVER POWER

The Seattle board of public works has rejected all bids for development of power sites and the city council decides to call for bids for a completed 35,000 kilowatt power plant on the Skagit river after plans have been drawn by the superintendent of lighting. It was also moved in council that corporation counsel prepare a resolution providing that the city council declares its intention to adopt the Skagit river site, and that such resolution, if adopted, be submitted to the government to guarantee the holding of the city's rights on the Skagit river until such time as bids may be received and acted on. Supplemental filings on this site have been made by the city. A \$500,000 deduction has been made by the council from the estimated cost of the plant, thereby reducing it to the sum of \$5,000,000, or the amount mentioned in the application to the capital issues committee of the Federal Reserve Board. The full capacity of the Skagit river project is estimated at 280,000 horsepower, the ultimate cost of which would be between \$40,000,000 and \$50,000,000.

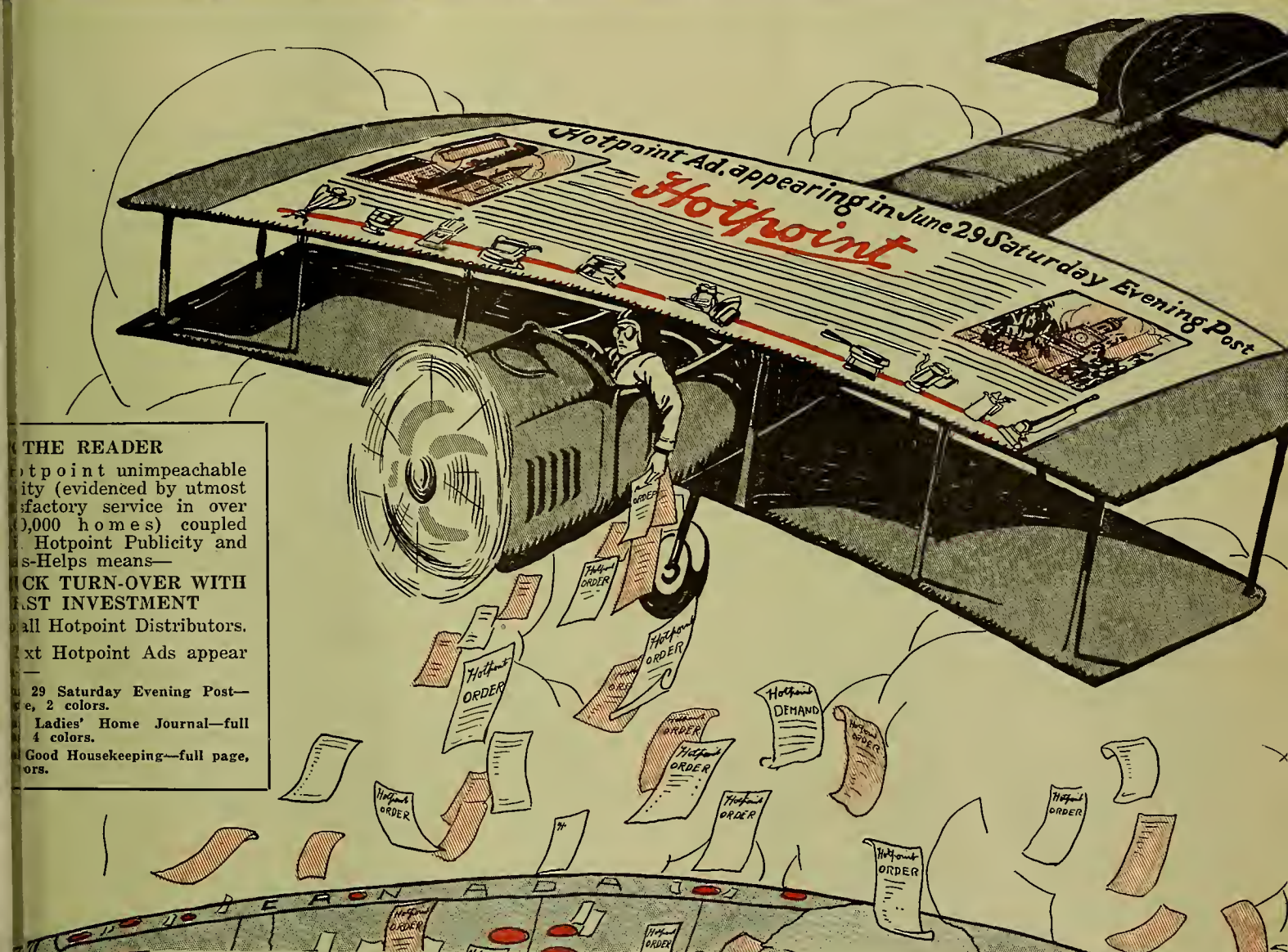
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JOURNAL OF ELECTRICITY

VOL. 40 No. 12

SAN FRANCISCO, JUNE 15, 1918

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THE READER

Hotpoint unimpeachable
reputation (evidenced by utmost
factory service in over
10,000 homes) coupled
with Hotpoint Publicity and
Sales-Helps means—

FAST TURN-OVER WITH SMALL INVESTMENT

Call Hotpoint Distributors.
Next Hotpoint Ads appear

in June 29 Saturday Evening Post—
2 colors.

in June Ladies' Home Journal—full
page, 4 colors.

in July Good Housekeeping—full page,
4 colors.

—it carries a business-producing message

The Hotpoint Message, in the June 29 Saturday Evening Post—as well as June Ladies' Home Journal and July Good Housekeeping ads—will further popularize the fuel-food-and-labor-saving HOTPOINT ELECTRIC WAY among many million readers.

It will mean increased business for present and prospective Hotpoint Distributors on the Pacific Coast and elsewhere.

This advertising will prove especially effective in increasing the use of Hotpoint lamp-socket appliances to help fill in the load valley caused by the operation of the Daylight-Saving Law.

The above mentioned Hotpoint Ads. will feature, among other appliances, Hotpoint Iron, Toaster, Grill, Stove, Ovenette, Vacuum Cleaner, Valveless Percolators and Boudoir Set.

See that you are supplied with ample stocks—also that you avail yourself of our extensive co-operative Sales-Helps which make it easy to sell Hotpoints.

HOTPOINT DIVISION
EDISON ELECTRIC APPLIANCE CO., INC.
Ontario, Calif. Chicago New York

Patronize Pacific Coast Industry—Our large Ontario, California, Plant can take care of your requirements promptly.



More Light on

CONDIT

Maximum Amperes 1200

Maximum Volts 15,000

Frame

Extra strong, heavily ribbed; carries operating mechanism and insulating bushings; also serves as support and cover for oil tanks; readily adaptable to any required mounting.

Mechanism

Insures easy closure of switch yet affords ample pressure at all contact surfaces. Provides for very rapid acceleration of movable contact members during the initial opening of the circuit. Easily adjustable to meet any condition of installation.

Brushes

Built up of special hard-drawn copper laminations and are self-aligning. Each lamina makes a positive and individual contact with the stationary contact surface leaving a definite space between adjacent laminae for free circulation of oil. Contact is long-wiping, self-cleaning.

Studs

Made of amply heavy copper rod, thoroughly insulated by high-grade, wet-process porcelain. The lower ends carry the stationary contacts.

Arcing Tips

Each brush is protected by two auxiliary arcing tips which are made of relatively heavy, special-shaped, hard-drawn copper, and are so mounted as to make contact with a similar stationary contact member. Each of these arcing tips is easily renewable and reversible, giving approximately twice the usual length of service, thus decreasing maintenance cost correspondingly.

Terminals

Terminals up to and including 800 amperes are enclosed in insulating sleeves preventing accidental contact with live parts. Switches and circuit breakers in excess of 800 amperes are provided with laminated terminals to which cable terminals or flat copper connections may be bolted.

Oil Tanks

Individual for each pole, made of heavy steel with welded seams. Easily removable for inspection. Reinforced against distortion by heavy "shorts." Oil line or tank exterior shows correct oil height.

Insulation

High-grade wet-process porcelain insulates each stud. Over-load trip coils are wound on porcelain thus thoroughly insulating same from face plate.

Face Plates

Made in two forms: Type "U" for service up to and including 800 amperes; type "U-1" for 1000 amperes or over. Automatic face plates may be provided with any combination of undervoltage, or shunt-trip attachments. Operators cannot hold the circuit breaker closed during an overload or short-circuit.

For complete description get Bulletin No. 418.

Type D-12 Oil Switch or Circuit Breaker

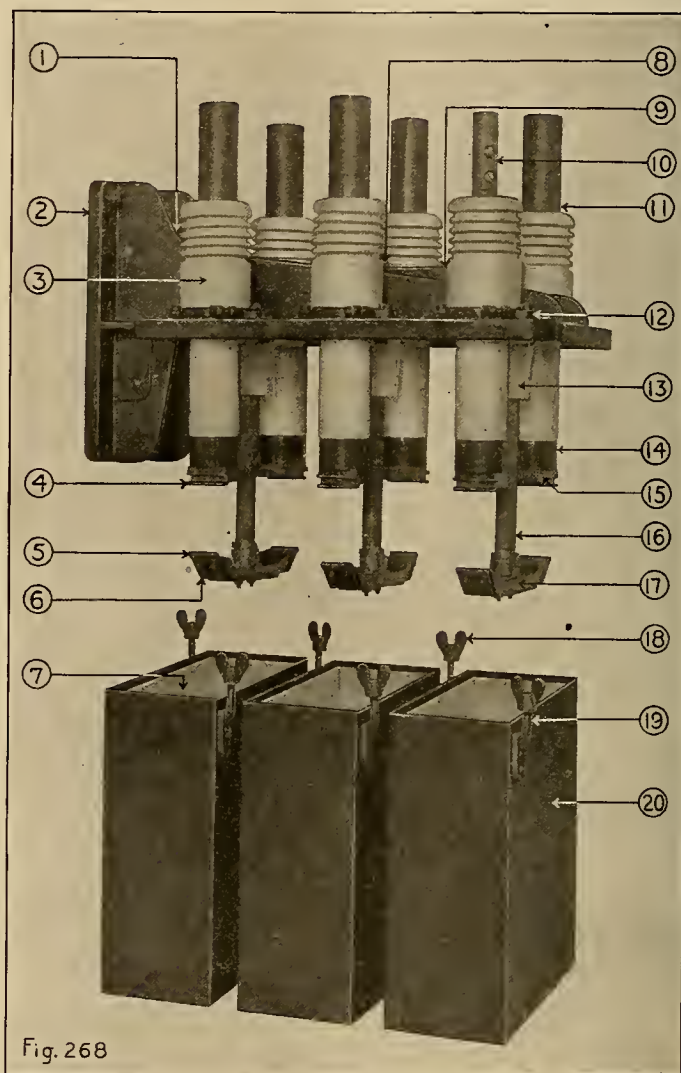


Fig. 268

Condit Electrical Mfg. Company, South Boston, Mass.

Manufacturers of Electrical Protective Devices

Akron, Ohio, 323 Ohio Bldg.
Albany, N. Y., 124 Hudson Ave.
Birmingham, Ala., Brown-Marx Bldg.
Buffalo, N. Y., 604 Electric Bldg.
Charlotte, N. C., Commercial Bank Bldg.
Chicago, Ill., 19 So. Wells St.
Cincinnati, Ohio, 1309-10 Union Trust Bldg.

Cleveland, Ohio, 1202 Illuminating Bldg.
Dallas, Texas, 409 So. Ervay St.
Denver, Colo., 1621 Seventeenth St.
Detroit, Mich., 617 Ford Bldg.
Kansas City, Mo., Interstate Bldg.

Los Angeles, Cal., San Fernando Bldg.
Miami, Fla., 329 Thirteenth St.
Minneapolis, Minn., 716 McKnight Bldg.
New Orleans, La., 818 Hennen Bldg.

New York City, N. Y., 39 Cortlandt St.
Philadelphia, Pa., 929 Chestnut St.
Pittsburgh, Pa., 706 May Bldg.
Salt Lake City, Utah, 216 Judge Bldg.
San Francisco, Cal., 583 Howard St.
Seattle, Wash., 552 First Ave. South
St. Louis, Mo., La Salle Bldg.
Washington, D. C., Conduit Road and Elliott St., N. W.

Northern Electric Company

Vancouver

Toronto

Calgary

Ottawa

Regina

Halifax

Winnipeg

Montreal

London

CONDIT: the Synonym of Safety in Electrical Protective Equipment

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FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

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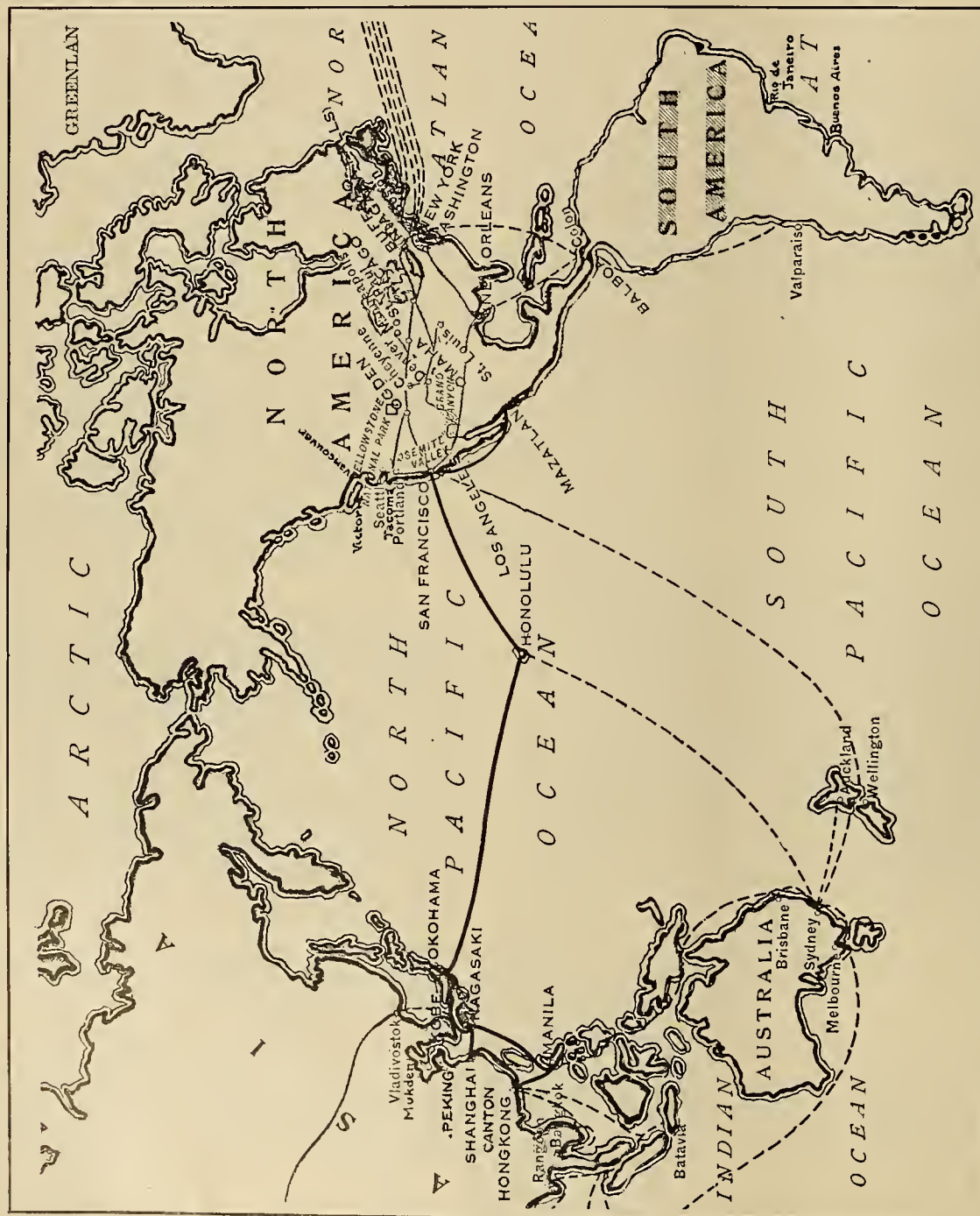
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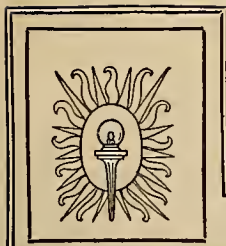
ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER

How the Upbuilding of the West is Helping to Win the War

XIII

CO-OPERATION, now the watchword of the hour among men of the electrical industry throughout the nation, is fast passing into an international sphere of activity. Vast opportunities for growth in commerce and engineering exist in the countries that line the great Pacific which may indeed be termed the last new West. A new spirit of internationalism is growing up among the citizens of these nations—a spirit of mutual helpfulness that means a growth in wealth and position without precedent and yet the greatest safeguard against future war that could possibly be devised.





JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40

SAN FRANCISCO, JUNE 15, 1918

Number 12

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SOME TEN COUNTRIES WHOSE SHORES are washed by the waters of the Pacific are now among the twenty-three great allied nations of the world, shoulder to shoulder, in the cause of humanity. Did it ever occur to you that it is possible to raise the ethics of industry in all countries of the world to such high standards and then so to live these ideals in daily life, as to make future wars impossible?



As this issue of the Journal of Electricity goes out not only to a very intensive group of readers in the Western states of America but with especial emphasis to chambers of commerce and engineering houses that line the countries bordering the vast Pacific, it is especially timely and appropriate to call attention to the new ethics in the electrical industry of America that have found their inception in the Pacific Coast States of America and have now entrenched themselves firmly in the hearts of earnest men throughout this nation. By analogy these new ideals may help to solve some of the present perplexing world problems.

To properly supply the consumer with electric ware and with the electrical energy wherewith to operate the vast electrical applications that have of recent years come into use in America it has been found that the electrical industry divides itself into four great divisions of effort. These great divisions represent in all an invested capital of two to three billions of dollars.

First come the manufacturers who design and construct the electrical apparatus and supplies, then the jobbers who take the manufactured product and wholesale it to the retailers known as contractor-dealers. This last division of the industry of course sell directly to the consumer. On the other hand there are the companies who generate electricity both by steam and water power known in America as central stations. These powerful institutions are themselves purchasers of manufactured products for use in their own power systems and often to encourage the further use of electrical energy in the home and in the office they have entered the merchandising business.

So it is evident that the various fields of activity of these four divisions have not in the past been clearly defined. In some instances the manufacturer has sold direct not only to the central station or to the contractor-dealer, thus eliminating the jobber, but in exceptional cases to the consumer. The job-

ber and the central station on the other hand have sold directly to the consumer and thus eliminated the contractor-dealer. There are many reasons that have justified this practice, although the lack of proper accounting methods and definite figures on the cost of doing business have left its justification often in a more or less hazy relationship.

This overlapping practice has been the source of much confusion and loss of unified collective effort in the past. Recent months have, however, evolved in the West a system of co-operative helpfulness that bids well to so cement the various branches of the electrical industry into one vast harmonious unit that it is believed the splendid good features of this work will not only justify its complete adoption throughout America, but that its helpful activities will rapidly spread to neighboring countries.

In brief, what is known as the California Electrical Cooperative Campaign recognizes the necessity of four great divisions in the electrical industry. Its ethics do not, however, forbid one class from entering the field of activity undertaken by the other, but they do insist that when such practice is thought advisable, then in so far as a particular group must enter the other branch, he must conform to all the rules and practices or in other words to the ethics prevailing in that particular branch.

To specifically illustrate: should the central stations find it to their best interests to continue the practice of selling electric irons and other appliances they may do so, but they must follow in such instances the ethics of good practice in vogue among contractor-dealers.

In the April 1st issue of the Journal of Electricity, were recounted the splendid results of the work in Southern California. Elsewhere in this issue may be found an account of a banquet meeting of over four hundred earnest men representing every conceivable branch of the electrical industry in Northern California. At this meeting men who are national figures in the electrical industry took a prominent

part and expressed the greatest confidence in the outcome of the new ideals evolved under this new departure in practice.

The whole affair means a gigantic stride forward for the good of the industry and it is hoped that as this account is read throughout the nation and in the neighboring countries that border the Pacific it will be a first message in planting the seed for future mutual helpfulness in engineering and commercial relations not only within our own nation but between these great and growing countries of a common destiny.

Those who attended the recent sessions of electrical men at Del Monte and closely followed the helpful results obtained are unanimous in the statement that the women's war service session participated in by wives of members present and by women in the employment of central station effort in the West was one of the most remarkable and helpful achievements of the convention.

It is rather surprising, in view of the tremendous new activities of women, and their splendid service in assisting utility helpfulness to the nation both in private and public service at the office and in the home that more emphasis was not laid upon this feature at the recent Atlantic City convention of the National Electric Light Association.

The National War Savings authorities have decided to put over the War Savings proposition June 28th, which date has been officially designated by the Government of the United States for that purpose. It is vital to the success of this movement, that as much publicity be given to the announcing of this date as is possible.

One of the great good features of the present terrible world conflict is the bringing home of the necessity of careful saving even in small bits. The little thrift stamps are fast becoming welcome guests in millions of households in America. They are thrice welcome: They teach us to save; they provide a store of funds for emergencies that may arise in the future; and above all, in the aggregate they make possible a gigantic storehouse of funds for the nation in order that it may meet the mighty drain now upon its convertible resources.

Let June 28 be to all of us a War Savings day for new resolutions and for a practical demonstration of our allegiance to the great cause we have so energetically undertaken.

General manufacturing and jobbing houses of the Pacific Coast report business active and the demand for merchandise of all kinds is good.

Shipbuilding, now a very important industry, continues to grow, some plants being enlarged and new ones started. The first cement ship having filled requirements by undergoing a most satisfactory trip under

adverse weather conditions between San Francisco and Seattle, several new orders have been placed because of the abundance of material and the fact that they can be quickly built with less skilled labor than any other type.

In practically all the Pacific Coast cities the wholesale and jobbing trade and all branches of manufacturing and industry are extremely active. Throughout the West the country conditions are excellent except in shortage of labor. The crop conditions are generally good although rain and irrigation water is short in part of the grain growing districts. In and about Spokane the agricultural conditions are excellent.

Taken as a whole there is much for encouragement throughout the Pacific Coast region in all branches of commercial, industrial and agricultural activity. This statement is borne out in the healthy support given to all the recent demands for Liberty Loans, Red Cross activities and other governmental requests which have received splendid oversubscription in practically all sections of the West.

The one great factor that is at work binding in closer unity the great countries that border the Pacific Ocean is the shortening of time necessary to transmit intelligence from one end of this vast area to the other. In consideration of this fact a brief review of the new world's records in radio service recently developed between the Far West and the Far East is timely and interesting.

At the outbreak of war, the United States Navy took over the entire radio service of the country. On account of duplication twenty-eight commercial stations were closed. All those in existence were brought together in a comprehensive system, and other stations erected. The new stations at Pearl Harbor, Hawaii, and Cavite, Philippine Islands, the most powerful stations in existence, have been completed, as well as the high-power station at San Diego, Cal. The Atlantic Coast stations are in direct communication with Pearl Harbor, and, with this one relay, a message can be flashed from Sayville, Long Island, to the Philippines. By January, 1918, direct communication had been established with Rome. The United States radio system stretches from Alaska in the north to the Panama Canal Zone in the south. In addition to this service, the Navy furnishes radio-operators for the rapidly increasing number of ships. To meet these needs thousands of wireless operators have been enlisted and trained. At present there are 5,000 at the two principal schools alone, those at Harvard and Mare Island, Cal.

This new and fascinating innovation in the Pan-Pacific means much for forwarding the future harmonious development of the vast area served. But best of all it means the promotion of a closer and more helpful understanding between peoples of widely different traits, customs, religion and everyday walks of life which, in the last analysis, means an effective stroke in forwarding the permanent peace of the world.

Considerable doubt seems to be in the minds of manufacturers and supply houses that are anxious to become known in the markets of the Pan-Pacific area, as to where to send catalogues and other data for proper display.

In this connection it is interesting to note that a number of the larger cities of the countries that border the Pacific are taking means to provide general reading rooms where information of this sort may be sent and a display made of it so that local merchants and others interested may find it of ready access.

Quite recently, for instance, Peru has established a commercial information bureau. The Minister of Fomento, believing that a great many small industries in Peru, especially mining and agricultural, are handicapped by not being in direct communication with either the markets from which they purchase their machinery and supplies or those in which they must sell their output, and also because of the lack of adequate facilities whereby the owners of these resources can inform themselves as to the probable market for the article to be produced, has decided to establish in Lima a Bureau of Commercial Information, the purpose of which will be to gather information that will be useful to the small industries of Peru. An invitation is sent to all manufacturers to send their catalogues and other data and assurances are made that they will receive kindly attention.

Again, here is an interesting notification that was published in Chinese recently in the leading newspaper in Mukden:

"We hear that the American consulate at Mukden has received catalogues from various well-known manufacturing firms in America. In consequence of this a commercial exhibit room has been established in the consulate which Chinese and foreign merchants are permitted to visit. A number of catalogues have been sent to the chamber of commerce. Should any merchants be unable to understand the details specified in the catalogues, an explanation of such details will be furnished by the American consulate. The consulate will be glad to obtain catalogues of any line of goods for which there is no catalogue on hand. (The European war has rendered it difficult to obtain cargo from Europe, therefore why should not the merchants call and examine these catalogues?)"

This particular office arranges facilities for those who do not understand English, so that the Chinese merchants have no difficulty in making practical use of whatever publications are sent.

The splendid facilities that are being arranged for the reception of manufacturers' data and catalogues in many of the great cities of the Pan-Pacific area bespeak kindly attention on the part of foreign departments of American manufacturing houses.

Engineering in all its various phases in Japan is becoming well handled by Japanese talent due to the earnest and persistent study and research of many of their more ambitious students in foreign universities, technical schools, and manufacturing centers. Local seats of technical learning are also turning out well equipped engineers to care in the future for the nation's industries and manufactories.

The ceaseless activity of her people, combined with an ever absorbing or driving ambition to surpass, will undoubtedly continue to bring about in the near future additional new creations in the industrial arts and in inventions. That the Japanese schools and colleges are today highly efficient and almost completely officered by native talent, driving home native ideals, is indeed a good sign for such individuality in development.

The graduates of her technical schools rank well with those of her citizens who have been educated abroad. The coalescing or combining of the product of these two systems of education as a means for forwarding commercial supremacy is the factor which will in the struggle of human existence call forth creative or inventive genius in the near future.

The increasing importance of electrical engineering and construction in Japan is best set forth by the fact that a surprisingly large percentage of our total foreign electrical exports go directly to Japan.

Most of our American firms find that the best way to form mutually helpful alliances with men of the electrical industry in Japan is to form in Japan firms allied with the home corporation and in which the home corporation owns a thoroughly representative interest in the stock.

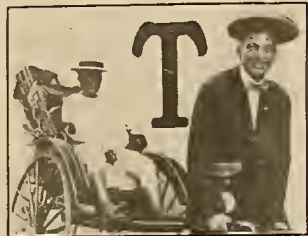
There is a new era in co-operative helpfulness that has been ushered in within all the allied countries. This effort is perhaps nowhere else in the world so far advanced as in the electrical industry west of the Rocky Mountains, where manufacturer, jobber, central station man and contractor-dealer are working together in an almost ideal relationship. This makes possible for a future spreading of these ideals to all countries bordering the Pacific. While the civilizations of the Far East are older than ours by thousands of years yet these men are unusually eager to absorb all the new ideas of helpfulness that America has put forth in recent years. Here is a chance for men of the electrical industry to carry ideals of mutual helpfulness to foreign shores and thus offer real constructive means for establishing the permanent peace of the world.

THE NEW JOURNAL SERVICE: The one big problem that is before the West in its service to the nation is how to finance and develop much needed new power developments. The issue of the Journal of Electricity for July 1, 1918, will feature this problem and set forth just where some of the great undeveloped water powers of the West are located, discuss their relative value and tell how the problem of development should be attacked. The issue for July 15, 1918 will tell of some of the remarkable advances in electro-chemical development that have taken place in recent months in the West. In order to meet the pressing demands incident to the great expansion in usefulness that the Journal of Electricity has undergone during recent months, it has been found necessary to add to its power equipment the latest design of Intertype electrically operated type-setting machine at a cost of several thousand dollars. In this machine not only is the mechanism electrically operated throughout but electricity displaces gas for the heating of the metal used in the casting of the type slugs. Friends of the Journal of Electricity are invited to see this splendid new application of the method electrical now installed in the composition rooms of the company.

AN ENGINEER'S OBSERVATIONS IN THE ORIENT

BY ROBERT SIBLEY

(Many American engineers have during recent months fully realized the new horizon of engineering activity in the Orient both in its broadened activity for aiding in winning the war and the new possibilities of usefulness upon the inauguration of world peace. Here is an account of some of the personal impressions gathered by the Editor of the Journal of Electricity when upon a recent tour of the Orient in search of statistics and information concerning future commercial and engineering possibilities of that vast region.—The Editor.)



TRANSPORTATION STUDY

An American engineer obtaining first hand information on Oriental transportation methods

THE present international war and the recasting of world thought into a greatly enlarged scope of activity make possible new ideals of service for American engineering endeavor along the shores of the Pacific and its islands in proportions hard to realize unless one has been an eye wit-

ness to these opportunities in the great undeveloped countries of this vast area.

South America and China, the one of manless land and the other of landless man, thus presenting opposite phases of populous development, are espe-

being so heavily felt among the lands bordering on the Pacific and its islands that constructive effort hitherto handled by European enterprise has of necessity passed into other hands. Out from a single American Pacific Coast port passed an eighth of a billion dollars in commerce to ports of the Orient during 1917. The new world now upon us makes it



HONG KONG BUSINESS DISTRICT

Hong Kong, the great shipping center of the Far East, has modern business structures in addition to a highly developed native business district.

imperative that America awaken to its new responsibilities in commerce now that the great emergency fleet is so soon to make its effect felt in the commerce of the world.

The question first arises as to how American engineering activity may best establish itself abroad. This must in large measure be a question of growth beginning with meager but well placed confidence upon which to build a great and lasting superstructure. To win confidence in engineering ability, the business ethics of our country abroad must be respected.

The foreign commercial policy of our own government must of necessity be an important factor



THE GREAT WALL OF CHINA

This is the engineering feat of all history—the Great Wall of China—stretching from the ocean on the east to the Himalaya mountains on the west, a distance of sixteen hundred miles.

cially interesting to the engineer and those handling supplies and industries allied to his field of work.

The onslaught occasioned by the present international war both upon men and commerce is now

in shaping the future destiny of America's share in this great work. The broadest possible national policy must be put into force, for the world, emerging from the great crisis of international war, will demand a truer, broader spirit of humanitarianism than ever before known to international life.

If as a country America is to gain prestige only the highest business ethics must prevail. The disgust occasioned by a certain American implement company unloading some years back huge quantities of ante-diluvian farm machinery upon the up-to-date farming of Argentine is current talk even in the far-off Orient. America can never hope to acquire the prestige desired unless such policies be done away with.



TRANSPORTATION IN MANCHURIA

Camels are a favorite means of transportation in Northern China.

Then, again, our merchants must study packing conditions in order to ensure the sane and wholesome arrival of implements, machinery and supplies in the foreign port. At Manila and in Hong Kong even in comparatively recent years it not infrequently happened that American made apparatus and shipments presented a rather conglomerated and dilapidated appearance under the strain and stress of climate and labor in the tropics. Such disasters never happen with shipments from countries used to the exigencies of the tropics.

It is hard for a machinery dealer, experienced in years of handling of shipments for American home consumption, to realize that when he attempts foreign shipments—especially those destined for the tropics—he must “unlearn,” as it were, many of the cardinal points of the shipping art he has so laboriously acquired and pursue methods wholly at variance with his former practice. The traveler gets his first inkling in such necessities when he attempts to use his camera in Hong Kong, for instance, and finds that the heavy humid tropical atmosphere has spoiled all his films. One of our largest American film companies illustrates an instance of how one must be alert and wide awake to such new conditions for in Hong Kong all films are sold in carefully sealed cans, thus meeting the difficulty. And so it is that labor conditions, customs of the people, atmospheric differences and a hundred other unheard-of factors in America, materially affect the safe arrival and efficient use of American made goods shipped to foreign ports.

The engineer too may well profit by these words, for after the preliminary investigation is made and development decided upon, his duties are

largely connected with problems of construction. And when it comes to problems of construction in the Orient, the engineer becomes at once an importer in the highest sense of the word.

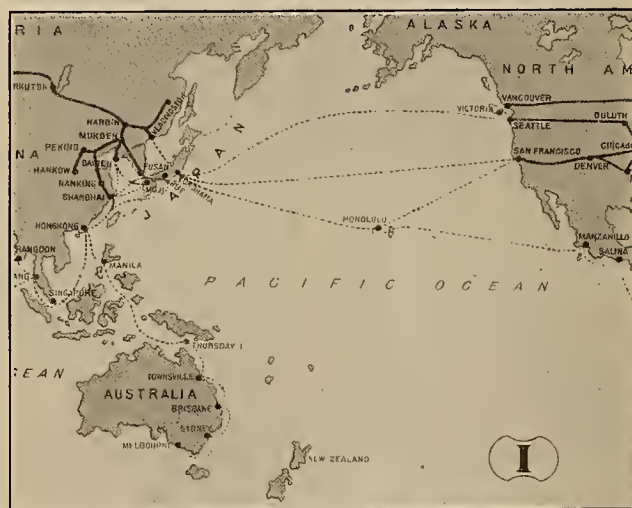
After all is said and done the personal character of those reaching the trade has perhaps more per-



PUBLIC CONVEYANCE IN KOBE, JAPAN

The jin-rikisha, a mode of conveyance quite popular throughout Japan and many of the Far Eastern sea ports.

manent influence than anything else in getting results. Formerly, those representing American business houses in the Orient were largely composed of adventurers. Today, however, it is interesting to see the alert, wide-awake group of young men



THE LAST NEW WEST

The great Pacific Ocean and the countries washed by its waters which constitute the final interlinking of the old with the new and offer opportunities of mutual helpfulness probably to an extent never before presented in the history of the world.

employed to exploit for instance the British-American Tobacco Company and the Standard Oil Company's interests through China. In a word, the old slogan

“Who misses or who wins the prize
Go—lose or conquer as you can
But if you fail or if you rise
Be each, pray God—a man”

applies equally forcefully among the ignorant but philosophical Chinese as among the most cultured and self-respecting classes in America.

Engineering construction and operation is largely accomplished by human effort in the Orient. Thus the residence portion of the city of Hong Kong, built upon a precipitous hill-side slope to get the refreshing monsoons or ocean breezes,

is a wonder for solid stone and heavy construction. Chinese women packed upon their backs practically all the materials used in its erection.

Men haul immense wagon loads of traffic in such instances where the burdens are too great to pack them upon their backs. Such portions of the city streets which are to be watered are covered by hand water carts operated by a native.



ON THE YANGTSE KIANG

The famous Yangtze Gorges, through which pass the waters of an empire more populous than any other district in the world—gorges that are capable of stupendous hydroelectric power development.

The signals of railroads are given by hand and watchmen hand operate closures at railroad crossings. Water is pumped by tread mills and small river boats are similarly propelled. Pottery and other industrial arts are manufactured solely by hand—no power driving mechanisms being used save those of human effort. In fact, human labor is so cheap and local prejudice against mechanical devices often so keen, that it is doubtful if our labor saving devices could really be applied in many instances in the Orient.

By far the most spectacular display of the futility of modern invention to overcome the local prejudice is to be seen in the coaling of the great ocean going liners at Nagasaki. Here thousands of tons of coal are loaded upon the steamers by women and girls. The coal is first brought in floats or barges to the sides of the vessel. Ladders are then erected to engage port holes of the vessel and the women and girls line up as formerly did the town fire brigade in passing water hand by hand to put out a fire. After having formed several of these lines, the coal is placed in baskets and these are passed hand over hand until it reaches the upper port where the coal is dumped and the baskets returned.

It is a pitiful though intensely interesting sight to watch the progress of coaling. The women, many

of them with little babies strapped to their backs work cheerfully through the long hours of the day



COALING A TRANSPORTATION LINER

The view of mothers with babies strapped to their backs and little girls filling baskets with coal, all assisting in the coaling of great ocean-going steamers, is a picture that long dwells in one's memory. The baskets are adroitly passed hand over hand to the ship's bunkers above and the complete coaling thus effected in a day's time.

working for a daily wage of fifteen cents, so I am informed.

Some of the cabin passengers amused themselves by tossing pennies down upon the barges and watching the resulting confusion in the fight for the coins. Some wit aboard conceived the idea of running down into the chief engineer's room and secretly "borrowin'" a handful of iron washers. These with great furor were tossed enmasse upon the barge. Thinking a tropical rain of money was taking place, the entire coaling crew dived in to gather the favors. After the mob tumbling and tussling had subsided and the joke was discovered, the simple folk on the rafts below enjoyed the joke



A VIEW FROM THE WALL OF CANTON, CHINA

Outskirts of Canton, the great metropolis of southern China, through whose narrow streets passes the commerce of an empire.

fully as much as did the passengers aboard. Needless to say, they did not suffer in coins to follow for the amusement furnished. One day is usually sufficient to accomplish in this manner the complete coaling of any ocean going vessel putting into Nagasaki for its supply of fuel. It is remarkable what gigantic results may be accomplished by such primitive methods oftentimes wholly without the aid of any modern labor saving devices.

On all sides one may note, nevertheless, the gradual but triumphant advance of modern methods

in construction. Indeed the thought processes of western civilization are rapidly being reflected in the garb wherewith the native attires himself. In the new commercial era so soon to sweep the Orient, especially in China, undoubtedly the old will give



THE SACRED BRIDGE, NIKKO, JAPAN

The ancient structures of Japan have a native grace and bearing, wholly unique. Yet, at the same time, in the symmetrical proportions the engineer easily discerns that although the designer was evidently not posted in mathematical laws of flexure and breaking stresses of beams, still it is evident that unconsciously the human mind has expressed them in actual accomplishment.

place to the new in an ever increasing geometric ratio.



THE DRYDOCK

The Chinese employed in the drydocks make excellent mechanics. They are industrious, use their wits, and at times are ingenious. They must, however, be strictly watched by an overseer who knows good work, and they know that he knows it.

be extremely neglectful and careless in his work if he knows he will not be zealously watched and inspected.

In Japan one is given abundant opportunity to observe ancient and modern construction side by side. And especially is one enabled to observe the decided influence of engineering ideals of western civilization as opposed to former methods.

The most gigantic illustration of former engineering effort that came under my observation was the huge statue of Buddha at Kamakura, about eighteen miles out of Yokohama. This immense statue is cast in bronze in five sections, as may be

observed in the illustration herewith displayed. A



THE GREAT ARCHED BRIDGE AT TOKYO

In the far East on all sides one sees evidences of the crowding out of the old and the setting up of the new. This is especially true in engineering design and accomplishment, and receives its greatest emphasis in the constructive effort of the Japanese.

comparative size is shown to the eye by the fact that the writer of this article, who is shown on the

arms of the statue, is over six feet high. Indeed the statue is so colossal that one may climb up into the head of the effigy and there worship Buddha at a shrine which is perpetually maintained for savants of the religion.



THE GREAT DIABUTSU

The great statue of Buddha, near Yokohama, Japan.—What another civilization has accomplished without the means and assistance of modern engineering thought and genius.

reflection he said that if no other foreigner had ever been allowed the privilege, he too would refrain.

To show the contrast of modern structure with these former ideals and designs, there is also shown in illustration the well proportioned stone arched bridge of Tokyo.

In conclusion, it is seen that the trend of Western civilization has forcefully made itself felt in Oriental life and beyond the question of a doubt Western economic constructive methods have slowly but surely proved more economic even over cheap labor conditions there to be found. As a consequence one may say with assurance that the new era ahead is largely to be one employing labor saving devices in every instance possible. And in this new era the broadened humanitarian ideals of America, devoid of a spirit of domination, but permeated with an overpowering yearning to be of helpful service in recasting the trend of world constructive effort, will prove of ever increasing importance.

BANKING AND ENGINEERING IN THE ORIENT

BY HARRY CHOYNSKI

(In spite of war conditions, trade with the far East has maintained a satisfactory level. With the new prosperity in China and more progressive banking laws from this side, there is no reason why the United States should not take a full share in the new trade era which is developing. The present situation, particularly as regards electrical wares, and the part which the banks must necessarily play in it is here interestingly analyzed. The author is vice-president of the Anglo and London Paris National Bank and thoroughly in touch with the oriental situation.—The Editor.)

Notwithstanding the many difficulties under which it has been carried on during the past few years, trade has been exceptionally satisfactory in Japan and quite good in China. This wave of prosperity is reflected in the banking and financial conditions, as demonstrated by reports, official and otherwise, reaching these shores through various channels.

Japan is rapidly swinging into a commanding financial position which will enable her to dictate lending terms to other nations. In construction and engineering projects, therefore, Japan can hardly be considered a fair field for enterprising Americans. Our advantage in that quarter will come rather through their ability to exchange with us a greater volume of products. It is entirely certain that Japan will be a real competitor in the building of new works in China, public and private, which promise a profitable return to the investor.

The world production of raw material being scarcely adequate to present needs, it is not surprising that demand for the commodities which China exports has been so well maintained. The result has been that the native received higher prices for his produce and in consequence has been able to buy more heavily in foreign markets, both of goods and of services. Continued prosperity within the Empire should create conditions wherein new enterprises may be successfully launched with capital derived from natives in co-operation with foreign investors, and under these conditions development should be fairly rapid.

When the war has ended there will undoubtedly be increased commercial and engineering relations between China and the Pacific ports of America. But we must commence immediately to erect a firm foundation to support the structure else competitors will develop advantages difficult to surmount.

That Japan is alive to the future possibilities of China is too well established to require comment here. Already she is seeking to prove her efficiency and her right to China trade. An elaborate electrical exhibition held in Japan in March was a function intended as a preliminary step on the part of Japanese electrical manufacturers to their capture of the China market for their wares. At least this is the impression gleaned both from the announcements and actions of those controlling the affair. The leading business men of China were especially invited

with a view to bringing home the development of Japan's electrical industries to China merchants whose vast possibilities as buyers of electrical equipment and apparatus must be thoroughly appreciated by the energetic and progressive Japanese. The press announced the exhibition as planned to advertise the future possibilities of Japanese electrical industries not only to China but to the whole East, and thus assist Japan's electrical purveyors to capture the Far East market for their products. In fact, the various exhibits seem to have been designed in such manner as to impress the visitors with Japanese efficiency in this line.

But the steady stream of Americans journeying to the Orient on business bent will bring back information regarding the constructive requirements of

an improved China. Here will be found a fertile field for the employment of capital in needed development work. However, the timidity of capital is proverbial and it is hardly to be expected that our funds will be employed abroad until representative American banks have been established for foreign service, whose campaign of education will not only stimulate interest, but create confidence.

The Japanese banking system, splendidly organized, has developed a number of great banks whose branches beyond the national boundaries encourage foreign trade and investment. Agencies of these institutions operate in the principal ports of China, alongside those British banks—especially created for foreign service—that have done so much to expand and assist British commerce in all parts of the world. French banks of some prominence have also been conducted along similar lines and have entered the China field. Before the war, Germany was represented in the Orient by The Deutsche Asiatic Bank, a powerful institution, whose chief function was to support German international commerce, and participate in loans that had some significance beyond the interest yield.

Unlike other countries, the Chinese commerce depends mainly upon the Foreign Banks concentrated at the Treaty Ports. While these banks, as at present constituted, do not undertake the financing of new works, they would nevertheless represent their own Nationals in superintending investment and collecting dues. With respect to such necessary representation, the United States has been sadly lacking. Whereas American banking regulations

China is in exceptionally prosperous condition. Japan in her enterprising way is preparing to capture electrical trade in China.

Chinese commerce depends upon foreign banks in Treaty Ports.

Under revised laws American banks are establishing foreign branches.

IN CONSEQUENCE

China presents a fine field for American engineering and commercial enterprise.

hitherto discouraged the establishment of branches abroad—the National Bank Act actually prohibited it—recent enactments wisely provided for our foreign development and already banks have incorporated for the particular purpose of operating overseas. Thus China, in its new-found prosperity, and America with new ambitions for extending its banking activities to foreign lands by joining forces, can create ideal institutions designed to foster industry and to provide for new construction.

Until the recent embargos become effective, China showed evidence of an increased dependence upon the United States for many commodities previously obtained from Europe. In practically all lines of iron and steel manufactures,—in short, all construction materials—the demand was limited by what we could supply. But this condition was the result of a world war which prevented the usual suppliers from participating in foreign commerce. To insure the continuation of this profitable trade, and to push our lines into a broader and more important field, the opening is imperative for agencies of American banking institutions such as are now forming. This is true of the known necessity of distributing interest bearing securities of some character, in order to provide the credits needed to purchase vast quantities of materials, machinery and equipment, and the nation underwriting the bond issues will undoubtedly sell the supplies. American capital invested in China could insist that all construction materials be purchased in this country, and when the projects were completed, all operating supplies would likewise be sent from here.

Due to the flotation of the various Liberty Loan issues we, as a people, are coming to understand bond investment, so that the task of wide distribution should not be so difficult, and when investment securities of foreign states are brought out under proper auspices, they should meet a favorable reception. This again emphasizes the supreme importance of carrying our banking power into the Orient as an advance agent in our scheme of expansion. And they must be institutions in which our people have the fullest confidence. Fortunately, it can be said at this time that combinations of capital now mobilized will be employed in foreign banking and that worthy projects will find adequate support.

Here, then, exists a fine field for immediate investigation by engineers, because successful participation in the competition which is inevitable after the war, will depend upon a proper understanding of conditions and its effective utilization.

ELECTRICITY SUPPLY FOR CHINA

In discussing the problem of electric supply for China at a recent meeting of the Engineering Society of China, Mr. W. J. Williams, after pointing out the great possibilities that await the future of this country, dwelt upon the necessity of centralizing power plants at places where water and fuel supply conditions were suitable, and the further necessity of standardizing the equipment, voltage, current, etc., so that interlinking of systems could be carried out at future dates. He suggested, also, that China

should profit from the mistakes made by other countries in multiplicity of voltages and frequencies met with.

AN INSTANCE OF FOREIGN ENGINEERING GRAFT

Some time before the American occupation of the Philippine Islands a group of architects and inspecting engineers were sent over from Madrid to construct a beautiful stone structure which was to commemorate, in a measure, the love and paternal ardor felt by the home government for its far-off possessions.

Now from Manila to Madrid it is considerably farther than a day's walk. Anyone that has spent days and days making this trip fully recognizes the fact. Evidently this group of "experts" had much time en route in which to ponder over this fact. At



AN ILLUSTRATION OF ENGINEERING GRAFT

Tradition has it that the full moneys were paid to the builders for the completion of this building, and that the money having been secured so easily, those standing in on the deal at the end of the year asked for an appropriation for janitor's service and repairing the roof and that this, too, was forthwith paid.

any rate upon arriving upon the scene of their sacred activity, work was commenced. With the true ardor and dash of the Spanish cavalier the stone foundation work was completed. About this time, however, one can imagine that one of those hot, languid tropical days for which that section of the world is so famed must have arrived. At these times the imagination gently wafts itself free from the body and like the dreamer under the influence of opiates, one sees visions. The inspecting engineers and architectural experts whereupon must have had their yearnings materialized even though in fancy and seen the completed structure in an hallucination. At any rate a report was sent to the home government that the work was completed and the remaining appropriations due for the construction. In due course of time the entire moneys for the completed work arrived. This structure so artistically "completed" is shown by the illustration as it appears today.

But listen, my readers, the story is but half told. The money for the completion of the structure came through so easily that when another year had rolled around, a bill was sent to the home government for janitor service and for repairing the roof. Tradition has it that this too made its prompt appearance in order once again to impress upon the bewildered Filipino the intense devotion held for him by the home government so far away.

POWER PLANT PRACTICE IN THE ORIENT

BY KAY INGERSLEV

(The history of electricity in the Orient is one of romance, of difficulty and opportunity. Conditions as they obtain in the power plants of Siam are more or less typical—and extremely interesting to one not familiar with the East or the Tropics, where the telephone poles and conduits are of teakwood—and the interpreter uses his own judgment in translating to the prospective customer. The author of this entertaining article, formerly electrical engineer with the Siam Electricity Company, has returned to this country.—The Editor.)



TROPICAL GROWTH IN BANGKOK

Siam suffers all the joys of the tropics from the white ant which devours telephone poles and wire insulation to natives who steal the copper wire from transmission lines.

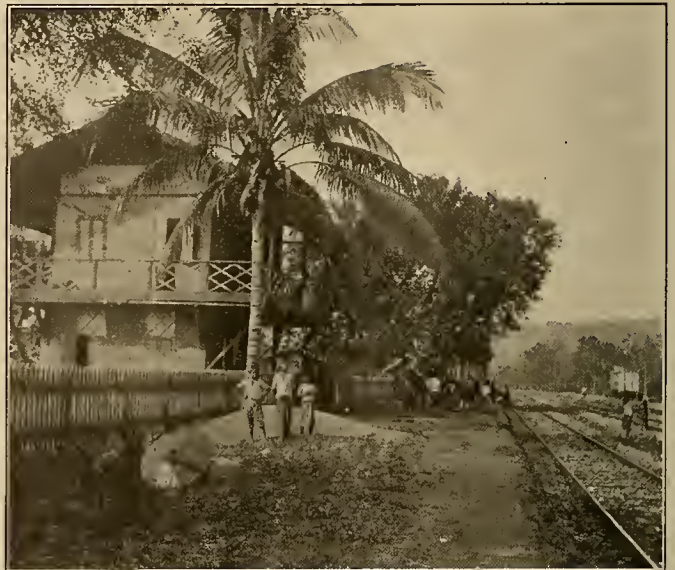
ment. The private company, Siam Electricity Co., Ltd., started in business as far back as 1898, and has by far the majority of customers; the government plant was erected about six years ago, and has developed very little since, largely on account of being a government undertaking, which has no shareholders to satisfy with a yearly dividend.

The Siam Electricity Co., Ltd., has a steam plant of about 5000 k.w., consisting of three turbines, 1000 kw. each, two Diesel engines of 200 kw., several old steam engines and two motor generators for the tramways. The original system for light and power was single phase 2300/100 volt, 100 cycles, four wire, neutral, not grounded, but at present only less important branch lines are operated single phase. The tramways are supplied with 500 volt d.c. from the motor generator sets. The fuel used is paddy husk (rice shells), this being obtainable very cheap and as a rule in plentiful quantities all the year round. Recently, on account of exceptional floods in the country, however, which devastated about two-thirds of the rice crop, oil had to be used. This increased, of course, the cost of operation considerably. Adjoining the power station is a workshop, employing about a hundred men. The work done is partly repairs and overhauls of the company's own materials, including tramcars, and partly motor car repairs and the making and upkeep of all kinds of electrical fittings and machinery.

A considerable business is done in milling machinery, the town having about fifty rice, saw and grain mills.

IT IS the intention of this article to give the reader a general idea of the present conditions in electrical development in Siam, and the importance for American industry to prepare the field for the future requirements of the Orient. Siam as a country is little known to the average business man on this continent, although it is one of the richest and most up-to-date countries of the Orient. The capital, Bangkok, with a population of about one million, has two power plants, one run by a private concern and one by the govern-

The distribution of current for light and power comprises by far the most important part of the business. The feeders (about 250 miles) are supported on wooden poles, and consist of ordinary stranded copper wires, maximum area of one feeder wire being 70 sq. miles. The poles are spaced about 35 meters apart, having an average height of 12 meters. The wood used is as a rule teak, this being the only safe kind to use on account of the white ants. It has been found that if a teak pole is prop-



NEW RAILROAD

From Bangkok to Singapore, about 400 miles. Dining cars and sleeping cars and all latest improvements are provided, but traveling by night is largely given up owing to the trains being attacked by elephants who become maddened by the noise and light.

erly set, and regularly inspected and treated with creosote solution, it will remain in service from fifteen to twenty years. The method of reinforcing old poles with a collar 50 centimeters high by 10 centimeters thick has been fully tried out, and the conclusion arrived at is, that if the job is properly done, that is, all sapwood and rotten parts removed before the concrete is applied, the pole will give service for at least another eight years, and naturally save considerable expense for the company, partly in the outlay of materials and labor, and partly in money lost in current and the inconvenience to customers of being disconnected for several hours. The trouble in the Orient is, however, to get experienced labor, and as competent supervision is expensive the company has lately gone in for concrete posts, and will probably in the course of a few years extend this kind of support to all its lines, as cement is cheap, being a product of the country.

The insulators used are of the ordinary pin type, maximum voltage being only 3500. These are all

manufactured in Japan, and up to the present time very little trouble has been experienced, although they are inferior to the American make. The company possesses a special testing plant for insulators; each lot is subjected to the dry and wet test, by a voltage eight times the working pressure, and during the last three years only about three per cent have broken down under the tests applied.

The transformers used are of the ordinary pole type, the make before the war being entirely German, but lately tenders have been asked for from American manufacturers. The climatic conditions are rather severe in regard to upkeep of transformers, six months dry season being followed by six months rain, and when it rains in Siam it rains.

Naturally the oil has to be inspected three times a year, and changed every autumn when the rains stop. Considerable trouble has been experienced

given full satisfaction, even during the six months of the rainy season.

The installation of light for customers is undertaken by the central station, which has a staff of about two hundred workmen, employed entirely on



STRINGING TROLLEY WIRE BY NIGHT

Labor is cheap but unreliable—in consequence concrete poles are largely being substituted for teakwood.

with water condensing on transformers having connecting boards; even the bushings for wire inlets have caused trouble during the dry season, the compound used not being able to stand the sudden changes in temperature from night to day. Some trouble by overheating of transformers was experienced about five years ago, on account of the neutral not being grounded, and the short circuiting of the third harmonic currents through the neutral wire back to the generator,—but as the neutral is now only used for single phase branch lines, this trouble has been eliminated.

The motors installed range all the way from $\frac{1}{8}$ to 200 h.p., the smaller capacities being mostly used for printing machinery, small grain and saw mills and pumping, and the larger motors for saw mills and rice mills, cement plants and water works. The pressure used for power is 100 or 175 volt; some 600 and 3500 volt motors are in use and these have



THE MARKET PLACE

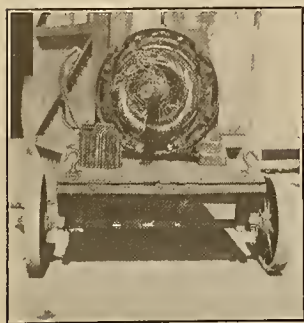
All markets are traversed by canals and in this respect the tram car has not yet come into its own. The Bazaar is coming to represent a considerable lighting load, however, as a large part of the business is carried on at night.

upkeep of lines and house installations. Two systems are used for inside work, one having the wires strung in varnished teakwood casings, and the other using regular conduits of the simplex type. The first is only used for wooden buildings; the latter for stone or concrete structures. The reason why the old-fashioned method of using wooden casing is still in practice is, that nearly every wooden house in town has white ants, and these beasts eat the insulations off the wires, if no regular inspection is made. The wooden casing, which being teakwood, in itself is safe against the ants, affords an easy way to ascertain the condition of the wires, by simply removing the capping for a few meters in the basement of the house to be inspected. The American product "Duraduct" was tried, but as it contains braiding it proved to be a regular joy for the ants, so it had to be abandoned.

Quite a considerable amount of fittings are sold as the Siamese lately have gone in for building regular houses in European style, and the monthly sale from incandescent lamps is from five to seven thousand. The system used for lighting the Bazaar and native quarter is a flat rate system, the light being switched on from 6 p.m. to 6 a.m. This way has become very popular among the small private customers, especially shopkeepers, as the best business in the Bazaar is done during the night hours. The oil lamp has been abandoned on account of the exorbitant price of oil even in this oil producing country. The tramcars are run from 5 a.m. to 12 midnight, the heaviest load being in the noon hour and from four to six in the afternoon.

The overhead construction is ordinary suspension from wooden poles in the town and catenary suspension in the suburbs, where the cars attain a maximum speed of from thirty to thirty-five miles an hour.

The question of bonding the track is rather a difficult one, as copper bonds are too big a temptation to the natives, if not fastened very securely; even then it is only a question of time before they will disappear. Only last year some of the 3500 volt lines were cut about seven times in one month,



25 h.p. motor used in the Bangkok plant

and several hundred meters 50 sq. mm. wire removed. The job was done during the night in the outlying district of the town. On account of this and the present high price of copper, the company has thought it advisable to introduce iron wire for suburban feeders, but as definite information regarding iron wire for transmission lines is very difficult to obtain, and as the present shipping conditions to the Orient are in an impossible state, the question has been abandoned for the present.

Nearly all the goods in Siam today are imported

from Japan, the reason being, of course, the shorter time of delivery and cheaper rates compared with the American or European markets.

The electrical goods manufactured in Japan are a cheap imitation of the American goods, but the trouble is that in most cases the local buyer finds it "good enough for the Orient." The writer has had occasion to meet several American commercial travelers in the Orient, and in most cases the man trying to sell American goods has not fully understood what the Japanese competition means. The ordinary commercial man, as a rule, does not speak the native language, and must always be led by an interpreter, and I can assure the reader that the conversation between the interpreter and the native buyer is very often something quite different from what it ought to be.

There is absolutely no limit to what the Orient will require in machinery of all kinds when this war comes to an end, and the time for preparing the field is right now. The Japanese is fully aware of this fact, consequently he is working hard to join his own ends. It is always more difficult to make a customer buy a new type of machinery, than to sell him the kind he already knows.

ELECTRICITY IN CHINA

BY R. A. LUNDQUIST

(China is awake—and in need of light. With the vastness of its possibilities, a new current of prosperity and a genuine "taking to electricity," the field is one which should appeal to American manufacturers. This remarkable article is written especially for the Journal of Electricity by the special agent of the U. S. Department of Commerce who has just returned from investigating electrical possibilities in the Orient.—The Editor.)

China, as a market for electrical goods, has only of late been to any extent recognized by American manufacturers. On the whole that country has apparently been regarded as an unpromising field for anything so modern.

The fact is that this great nation of an ancient civilization is rapidly developing a demand for electrical service, and plants are constantly being constructed in all sections of the country. At present, however, there is no impressive total number of stations in China, there being probably not more than a hundred cities that have electric service. When consideration is given to the vastness of the country and to its population,—somewhere near 325 millions,—it will be evident that the electrical development of the country has only begun.

In view of the small number of plants that have gone in so far, the total trade in electrical goods is as yet not large. In 1916 the imports classified under "Electrical Materials and Fittings" totaled 3,431,571 taels (\$2,710,941), while "Propelling Machinery" (as Boilers, Turbines, etc.) amounted to 576,503 (\$455,437), and "Telegraph and Telephone Material" to 611,143 (\$482,814). The smallness of the trade at the present time, and a tendency on the part of our manufacturers to regard China as it was when they studied it in their school-days, tends to deceive them as to the real possibilities of the field.

With its immense population, a progressive tendency and an increased purchasing power on the

part of a very small percentage of the people will mean a large gross number. One per cent of the population aggregates three times the population of New Zealand, or three-fifths that of all Australia. Moreover, such a percentage of the people of China will represent a greater purchasing power than will the general average of the people of Australasia, to continue the comparison.

While China is outwardly and politically poor, as a nation, there are a large number of very wealthy merchants and officials, and as a general thing the people "take to" the use of electricity and of electrical appliances very readily. This is very apparent. As one strolls along a Chinese street at night, in in such cities as have electric service, he is impressed by the numbers of small shops of all descriptions that have electric lighting. Furthermore these shops are well lighted, and it can be said that the foot-candle intensity is greater in the average run of small Chinese shop than in many a store of equal importance in a small American city.

The use of electric power is at present quite limited except at a few treaty ports, and as a matter of fact there are not throughout China many industries at present to which power can be supplied, because so many of them are on such a small scale. Power-using industries, however, are being established gradually.

While China has been regarded as a "cheap market," this is not exactly the true situation. Installations must naturally be cheap to enable many

consumers to use electricity, but on the other hand there is a strong demand for high class goods from others. It has been said that the Chinese desire good quality in large things, but that in minor devices cheap goods will more likely be favored. It will no doubt be advisable for American manufacturers to offer both qualities in order to meet the requirements of the market as broadly as possible. It may be noted here that a Chinese buyer knows quality when he sees it, and personal observation showed that there was a great deal of high-class equipment being used.

The great future of China as an electrical market will come with the development of its natural resources. This will result in a wider use of machinery and in the establishment of proper transportation facilities throughout the country, and with such a development will come an increased earning power on the part of the people. The increased earning power will broaden the present possible use of electricity, in addition to what is directly used in connection with the development of the natural resources

of the country.

Summing up the situation, there should be a rapidly growing demand for electrical goods in China in the next few years, and American manufacturers can secure a fair share of this trade. They must, however, be prepared to enter the market now, and must be willing to observe the details that are essential. They must arrange for proper representation, they must offer goods as the Chinese want them, and in some cases they will find it advantageous to be in a position to extend liberal terms to native companies where new developments or large extensions are concerned. Satisfactory shipping conditions must also be arranged for, and that means American ships for American goods in the ultimate analysis.

The Chinese people look upon America as a friend, and American manufacturers have sentiment strongly in their favor. If they accept the opportunities presented and make serious, conscientious continued efforts, they can build up a strong and valuable trade in electrical goods with China.

FOREIGN TRADE AFTER THE WAR

BY JOHN CLAUSEN

(The possibilities before America at the conclusion of the war in the way of international trade are unbounded—but we must learn to take advantage of them. As yet the United States citizen has not learned to invest his money in enterprises abroad, nor have the banks been in a position to give proper support to the trader. The author of this clear-cut exposition is vice-president of the Crocker National Bank of San Francisco and an authority on international trade questions.—The Editor.)

Whether the end of the war is near or far, not the least among the many evils of a prolonged international struggle must be considered the artificial world-wide conditions which such a state of affairs brings about. The usual relationships of commerce have been disrupted and altered to the extent that new means for carrying on any form of international trading have become a daily issue and of constant necessity.

The test, in so far as it has served to rouse American public opinion in international affairs and to an understanding of commercial interdependence of nations, has been of especial benefit to the United States. While there may be too much optimism as regards our opportunities, there will doubtless be a change in our commercial and financial position when the present world-wide strife comes to a close. It may be safe to predict that the volume and direction of our trade will be different. The ability of European nations to furnish capital to develop other countries will, in all probability, be lessened, perhaps for a period of many years to come. South and Central America, China, and Mexico may turn to us more than ever before in the purchase of goods and for their financial needs.

The International Commerce of the United States in the past has not been far different from that of any new country which had great natural resources and was sparsely populated. There was more to be made by developing our own resources and domestic trade than in producing manufactures for export in competition with the cheap labor of

older countries. As the time went on and our population grew, we became the greatest consuming nation in the world. Our manufacturing interests rose to more importance until in many lines we lead all rivals, not only in volume of product but in economical production, because of so varied and abundant a supply of raw materials, which made it possible to organize production upon a great scale.

When the war is over we cannot, however, expect to employ all this capacity in simply supplying our home markets. In order to keep these works busy and the wage-earners employed, we must find markets abroad, and there is every reason to believe that other countries will be in great need of all the things with which we are bountifully blessed. But this demand for goods will undoubtedly be accompanied by frequent requests for credit and by appeals for the people of this country to take their pay for these products of our factories in securities, which will virtually represent an interest—either as lenders or proprietors—in foreign enterprises.

In wealth, our superiority is undeniably great, but it is not yet certain to what extent this wealth will be available to support our international trade and other activities. A similar body, although less numerous, has been developed in Germany, France, Holland and Belgium. The question with us is whether we will know how to use our new position in world affairs, and our new wealth in such manner as to internationally strengthen ourselves and develop such a constituency behind our industry.

THE STANDARDIZATION OF FREQUENCY

BY H. E. WARREN

(Although manufacturing plants have hitherto at one time or another experienced difficulties owing to fluctuation in frequency, the matter of standardization was not one of pressing importance until the present tendency toward interconnection of power systems has made its consideration imperative. The new system, described here, simple enough in itself, promises not only to revolutionize power plant practice in this respect, but to introduce a new load for the central station in the possibilities of clock installation.—The Editor.)

In view of the rapid consolidation of the great power systems of this country, it is a little strange that no particular effort has been made to standardize the frequency. It has been assumed that the ordinary frequency meters found in all power plants are sufficiently correct for practical purposes and discrepancies between the various meters which happen to be connected to the same system have been overlooked. Some one of the meters may have been chosen arbitrarily as a standard for the system.

As a matter of fact, practically all of the commercial frequency meters in use are liable to errors of calibration, variations with wave form of the current, changes due to age and use, and other marked variations due to temperature. In consequence it has been found that such frequency meters are quite likely to be as much as 1% or 2% in error either high or low.

The great importance of accurately standardizing and maintaining the frequency as nearly as possible at its true normal value cannot be too strongly emphasized:—

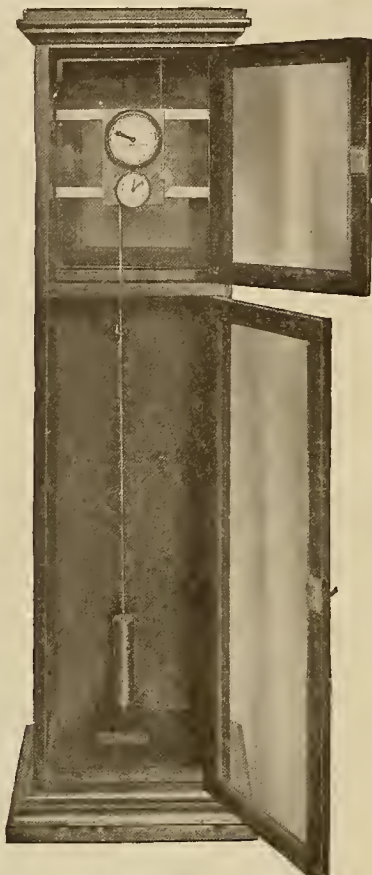
1st. The efficiency of generators and turbines will vary with any departure from normal frequency. An error in the average value of the frequency of 1% may mean appreciable loss either in capacity of the turbines or at their points in the electrical system. Even the transformers are affected by variations in the average value of the frequency.

2nd. The speed of ordinary forms of alternating current motors varies of course directly with the frequency. As a result all machinery used for manufacturing is also affected to the same extent. If the motors are properly geared so as to drive the machinery at its most efficient rate when the frequency is normal, it is clear that any variations of

the average value of the frequency will correspondingly affect the output. Even an increase in the frequency under such conditions may actually reduce the output. In a cotton mill, for instance, the looms may not run faster than certain speed without producing an imperfect product and if they run any slower than the most efficient speed they will of course produce less product. In a factory of this kind an error in the average value of the frequency of 1% may mean a reduction in the daily output of 1%, which is an exceedingly serious matter.

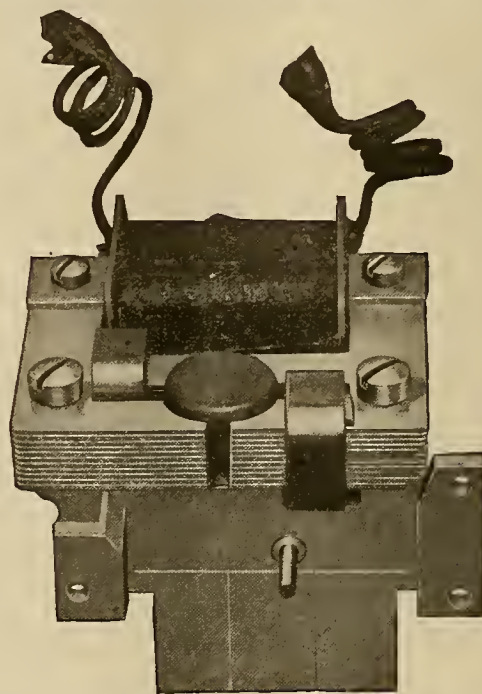
3rd. The accurate standardization of the frequency in independent power plants facilitates their interconnection. Obviously two stations which are running at 60 and 65 cycles respectively cannot be connected until some common value has been agreed upon and this may mean a hardship to one of the companies or its customers.

There have recently been invented some very interesting types of small self-starting synchronous motors. One form is shown in Fig. 2. A very useful kind of frequency meter has been developed by



THE MASTER CLOCK

By keeping the second hands together it is possible to maintain an absolutely even frequency—Fig. 1.



NEW SYNCHRONOUS MOTOR

The union of this device with a very accurate clock, constitutes the frequency motor here described.—Fig. 2.

the union of one of these motors with a very accurate clock. This device, known as the Warren Master Clock, is shown in Fig. 1. The upper dial which is about five inches in diameter has two second hands revolving about the same center. One of these hands which is black is controlled by a pendulum and keeps true time with an error less than

a second per day. The other hand which is gold color is directly geared to a motor like Fig. 2. The ratio of the gears is such that at normal frequency the gold hand will move just as fast as the black one.

The master clock is located at the switch-board or in a load dispatcher's office and the operator in charge of the frequency uses it instead of the regular frequency meter. From time to time he notes whether the gold hand is ahead of the black hand or behind it. If the error is more than a second or two he adjusts the governors of the turbines slightly.

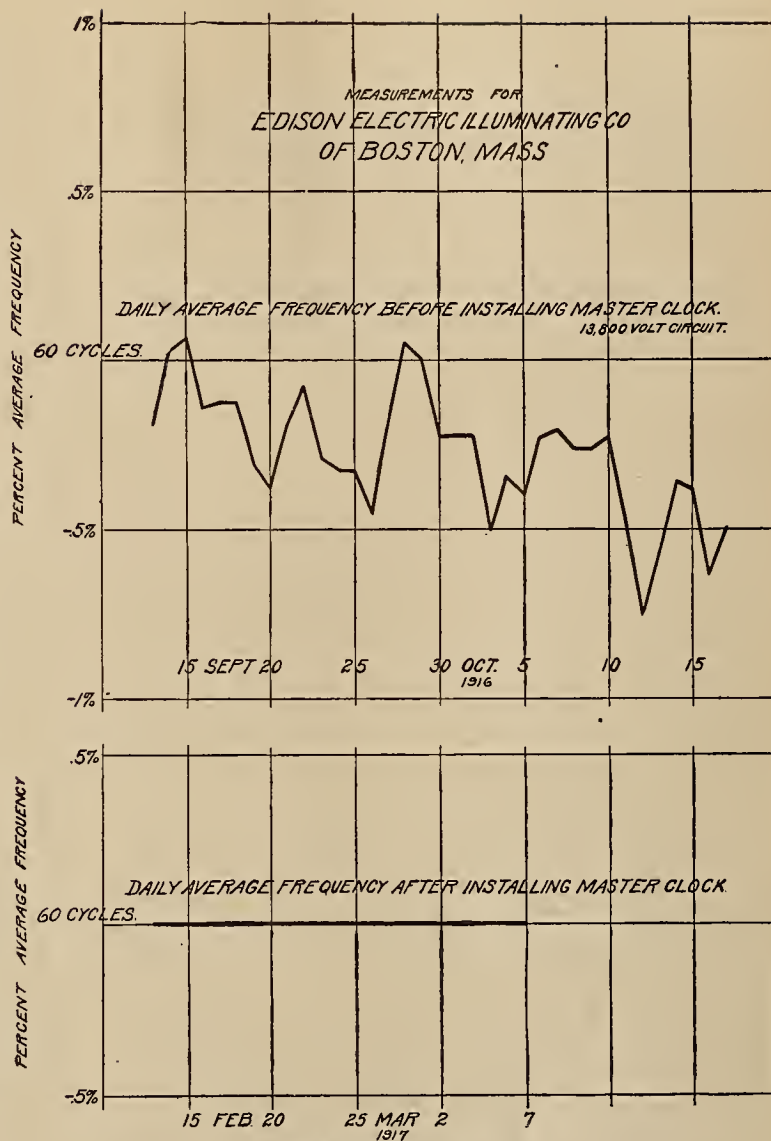
This method of regulating frequency, which is rapidly coming into use in the eastern states, saves labor for the following reason:—

The master clock indicates only an error in the average value of the frequency and is practically unaffected by momentary fluctuations. Therefore the operator observes only the tendency of the frequency to depart from its normal average value, and this is a real error of the governors which needs correction. Under ordinary conditions, however, such correction is required rather seldom,—for example, at 20 or 30 minute intervals.

On the other hand, an ordinary frequency meter indicates only instantaneous values of the frequency. Momentary fluctuations above and below the average value are bound to occur frequently in response to sudden load changes. The operator who looks at the instrument at any instant naturally assumes that it represents a condition which needs correction if it reads above or below normal. Therefore he immediately applies corrective adjustment. The next time he looks at the meter after a very short interval, he is likely to find that new correction is needed in the opposite direction. In fact, a large part of the speed adjusting which he does is worse than unnecessary, and the turbine governors themselves would produce better results if left alone for much longer intervals. The saving in labor by the master clock method is probably 50%.

The precision of the average value of the frequency is incomparably greater by the master clock method. Fig. 3 shows in the upper curve the average daily value of the frequency of the Boston Edison system from Sept. 15th to Oct. 15th, 1916, during which time regulation was by means of ordinary frequency meters. The lower curve which is on the scale contains no visible departure from a straight horizontal line. This shows the daily average frequency of the same system during March, 1917, when a master clock was in use. The error in the daily average value by the former method frequently ran over one-half of one per cent, and was very irregular, depending upon the temperature. The error in the daily average value by the new method is seldom greater than one five-hundredth of one per cent, and is wholly independent of the temperature.

The result of this remarkable precision is not



BEFORE AND AFTER
The effect of the installation of a master clock is here strikingly illustrated. Note the marked irregularities with the best regulation possible under the old system.

only of benefit to a power company and its customers by reducing losses and improving the service, but it also adds a new kind of value to the service. Anywhere on the system it is possible to connect a clock driven by the same kind of self-starting synchronous motor that is used in the master clock. These motor-driven clocks will tell time continuously with the greatest accuracy, and it seems probable that they will ultimately become as common as telephones or any other electrical necessity.

RADIO STATION FOR HONGKONG OBSERVATORY

A receiving installation for the radio station, Royal Observatory, Hongkong, is now being constructed. The station is located at the observatory, in latitude 22 degrees eighteen minutes thirteen seconds in latitude 22 deg. 18 min 13 sec. N., longitude 114 deg. 10 min. 15 sec. E., of Greenwich. The installation consists of a single triangular steel-lattice mast 100 feet high. The aerial (which is on order in America) will spread from the mast to six chimney stacks of a terrace of houses 150 yards to the south of the mast.

ON BEING A MOTOR SALESMAN

BY H. P. PITTS

(Some very pertinent observations in a maze of good fun. Needless to say, the author is not a motor salesman in reality, but head of the commercial department of the San Francisco office of the Pacific Gas & Electric Company. The paper is one of the series being given at the luncheons of the San Francisco Development League.—The Editor.)

At the age of 15 years, I decided that I would become a salesman. My reason for making this decision was that I had been told that I was not fit for any other vocation, and upon analyzing the situation as to just what class of goods I would like to sell, through a process of elimination, got down to two classifications, that of dry goods and electric motors. On the final decision I choose the latter because I found I would be in touch with a more live class of people, and would probably be able to carry a larger expense account, due probably to the electrical people having more money to spend. This expense account matter appealed to me greatly, a subject which I will touch upon later.

Upon determining to become a motor salesman I would not take the advice of my friends and study electricity. I thought it was only necessary to increase my acquaintanceship, as I considered anything electrical would probably sell itself.

In my course at high school I paid no attention to the studies of mathematics and physics, but rather clung more to the subject of languages, etc., so that when I graduated from high school I could speak four or five different languages, but had not developed much in chemistry or mechanics.

With my diploma in my hand I struck out to get a position with an electrical concern, and through being acquainted with a banker, was located with one of the largest concerns. After having been with the concern for two or three months I complained to the management because they did not put me out on the road selling, was told in reply that inasmuch as I knew nothing about the business it was my duty to study this electrical business and I was advised of a number of correspondence courses which I could avail myself of the privilege of taking up, together with good literature which was published by the company. I thought over this advice with the result that I gathered up all catalogues and publications issued by my company and took them home and spent two nights going over them but found nothing that would interest me. I made out an application to a correspondence school for a course in electrical engineering, made the first payment and studied one or two examinations, but soon got tired of that. I knew all a good salesman would have to know was to become acquainted with people and just sell. Matters went on for several years, and while I received the publications from my company, together with good reading matter pertaining to my profession, I felt that if I worked eight

hours at the office during the day I was giving all the time my company was paying for, and that time after hours was my own to do what I cared to do. On several occasions I was called in to the sales manager's office in reference to my progress and felt by all these interviews I had convinced the sales manager where he was getting off at, and that I was satisfied myself that I was getting on far better than he had given me credit for.

The time came when I was to start out as a salesman, and I was given a territory in a large city. I was overjoyed. I learned later, however, that this position was given me because there were young fellows who were coming along and room had to be made for them. I was given the names of a number of concerns that I was supposed to call upon. I started out full of confidence, and the first corner I turned I dropped into a cigar store and bought a dollar's worth of cigars. I had previously fortified myself with a quantity of beautifully engraved cards with my own name in large letters and the name of the concern down in the lower left hand corner. Upon lighting a fat cigar, blew into the office of the purchasing department of the first concern on my list, and sent in my card (permitting the tissue paper to stick to the face of it). He kept me waiting ten or fifteen minutes, which treatment made me quite impatient and I sent along another card saying that inasmuch as I had been given a number of concerns to call upon that morning, and had a large stock of motors to sell, I would appreciate it if he would give me an audience. The result was that he sent for me and I rushed into his office—no one could accuse me of not being enthusiastic. He didn't seem at all tickled to see me, for he did not even stand up to shake hands with me, but I was wise to something, and the first thing I did was to blow a cloud of smoke into his face, reached out my hand to shake hands, and inasmuch as I heard older salesmen do so, called him by his first name, then poked a cigar into his left hand. He took the cigar and laid it on the ink stand and picked up several papers and began reading them and

would not give me very close attention, so I told him that if he wanted to buy any motors from me he would have to pay attention to what I said inasmuch as I represented a large company. He said he was not in the market for any motors at present and that he would let me know when he wanted to see me. I sat and talked to him for probably ten or fifteen minutes, during which time he wriggled around in his chair and acted as though he was not altogether interested in me or my company. I finally thought I would make a lightning hit and invited him to go to lunch with me. He stated he was sorry he could not go with me, rather intimated that his lunches were

taken up with other important matters. The full blow of this expression I did not "get" until I had left his office.

I called on all of the men comprising the list

TEN EVENTS IN THE LIFE OF A MOTOR SALESMAN

1. He specializes in languages at school.
2. He gets a job through a banker friend.
3. He takes a correspondence course, and drops it.
4. He spends his evenings as he pleases.
5. He buys cigars.
6. He calls customer by first name.
7. He tells "racy" stories.
8. He does not know his line.
9. He fails to join electrical societies.
10. He has gained a reputation.

I had been given and although I worked like a horse that day, did not sell anything, but felt quite encouraged, inasmuch as I had had an audience with each one and was told in each case that they would bear me in mind. I had heard that our sales manager had said he did not expect I would do much for the first few days, so I felt satisfied with myself.

Two or three days after I called upon my first purchasing agent again and he seemed a little more interested in seeing me, asking me questions as to the type of motors, etc., and just what we had in stock, and as to whether I considered direct current motors better than alternating current for certain types of work. I told him I did not have my books with me, but would look up this matter and report to him. He said he was in the market for a rush order and would be very glad if I could give him the information right away. I told him I was very sorry I did not expect these questions would ever come up, so would have to search in my books for the information, which would probably take a day or two because I had to call on some other men. The pressure of business made me forget to look up these questions; the result was one of my competitors got the business. This did not make me feel badly, because I knew he was a much more experienced salesman.

Upon calling upon my second man that day I found a friend, as he seemed willing to listen to several of the stories which I had accumulated; in fact, it was good ammunition to feed the purchasing agents, inasmuch as I considered their whole business was to listen to the talk of the salesman. While he listened, he did not seem to see the point of some of my stories, and did not come back with the usual "That reminds me," so I made up my mind that I would dig up some others which probably were of a little more indecent character to see if I couldn't gain a point. I left his office at about noon, and inasmuch as I had not had a chance to spend some expense money, I went and had a 25-cent lunch and charged \$3.00 expense for having taken John Doe, purchasing agent, to lunch.

Upon calling in the afternoon on one man I was asked if I belonged to any of the electrical associations and upon informing him in the negative, was asked to join the National Electric Light Association. I informed him that I knew my company belonged to such associations, but thought they were not for electrical salesmen inasmuch as I felt nothing ever transpired at meetings that would be of benefit, and that I had taken precautions of increasing my circle of friends by other methods. The dues were only \$5.00 a year, but I felt that I could use the \$5.00 better by buying cigars and drinks for the boys than in joining any educational association.

I continued to call upon the men in my territory and the more I called, the more I was left sitting in the ante-room, word being sent out to me, "Nothing doing today." So I finally started to devise means of getting business. The sales manager had called me in on several occasions and told me that, while I was learning the business, yet I was supposed to bring in some business or show an inclination to get prospects. On the last occasion of being on the carpet, I assured the sales manager that I felt that I knew my business,

for I had been with the concern for several years now, and that I noticed the general run of people seemed to like me fairly well, that I had spent a good deal of money on clothes and entertaining, and was spending my evenings among people who I thought if they did not require my goods would tell their friends what a good fellow I was. I had been years in the business, followed along these same lines, feeling I had been done an injustice by my company, in that my salary had not been increased according to the number of years I spent with them. I still received the printed matter and publications from my company and kept them well bound and dusted off in my bookcase, had not thought it necessary to bother my head as to the type of business that my prospective customers were in, thinking that that was their business, had had a number of encounters with the manager, who had taken the attitude of pitying me rather than censuring me, a lesson I did not seem to appreciate until after leaving his presence, I still depended upon the cigars and lunches to increase my business. I have proceeded along these lines until I feel that I have established quite a reputation for myself. But I have sold few motors.

UTILIZING THE WOMAN-POWER OF THE NATION

A recent bulletin sent out by The American Society of Mechanical Engineers urges local branches to take advantage of an opportunity to accomplish a real service to our country by taking prompt action in getting the industries to co-operate with the universities, colleges and technical schools in utilizing the great woman-power of the United States by educating them through short intensive courses of study as set forth in the following resolutions adopted by the Detroit Section of the A. S. M. E. and the Detroit Engineering Society, in joint session, May 3, 1918:

WHEREAS, the demands of the country for men and means to fight the war has resulted in a deficiency of skilled workers in the trades and professions; and

WHEREAS, the women of this country could with a short period of training fit themselves to fill these positions, as women have done in other countries at war; and

WHEREAS, among the things which women could do advantageously are drafting and tracing, inspection and testing of materials, both physically and chemically; therefore

RESOLVED, that the Universities, Colleges and Technical Schools throughout the land be asked to consider the question of meeting this demand by providing special courses of instruction open to women students qualified to pursue such courses; and further

RESOLVED, that employers who could use such skilled help exert their influence with their Universities, Colleges and Technical Schools, and co-operate with them in developing and making available a great body of intelligent and adaptable women who are as eager and willing to serve their country as their brothers;

THEREBY bringing about not only increased effectiveness in fighting the war, but also a greater mutual respect and a truer relationship of our men and women.

WOMEN IN THE INDUSTRY

WOMEN IN THE ENGINEERING DEPARTMENT

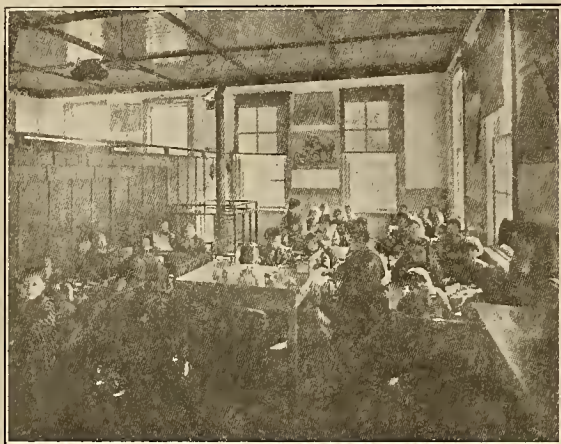
A recent article in the Western Electric News points out the various technical positions held by women in that company. The number of women—other than typists, stenographers and clerks—employed in the Engineering Department has been gradually increasing since about 1914. It was then that Miss Gaston, in her capacity of librarian and translator of all tongues, including the Scandinavian, and the slip-stick artists (variously known as computresses, calculators, calculizzes, etc.) made their appearance. Most of these young women were college graduates to whom school teaching was evidently not the one and only resort.

All of them were at first assigned to one group. Requests for translating, reference work and computations were made on this group. Later, when the

special condensers and fuses which, for various reasons, must be manufactured under laboratory conditions. This work does not of necessity call for operatives with more than average education, but it does mean the presence in the laboratory of a fairly large number of women. If any of them show special aptitude or inclination, it is a fairly easy problem to acquaint them with the workings of the simpler measuring devices and to instruct them in the making of various mechanical tests on apparatus under investigation for all sorts of reasons. Naturally, tests and measurements, as in the Transmission Branch, are a good field for the employment of girls with technical training; and so we add some more to the collection. At present the Chemical Laboratory employs two young women on routine analysis and solution work—holding out the prospect of research work hitherto delegated to men only.

Up to now the Research Branch employs fewer women than any other division of the Engineering Department. This is probably due to the fact that, as the name implies, the work of this branch is almost entirely of a research nature, although it may be because of the relentless researchers are so exclusive that they don't know the war with Spain is over. At all events, in this branch the work of the women is mostly clerical.

For girls with some technical education, classes in advanced physics and in telephone practice are held. The object of these classes is to acquaint the students not only with the general principles underlying their work, but also to present to them the peculiar problems constantly arising in the telephone field.



AS THEY DO IT IN THE ORIENT

A kindergarten maintained by one of the large factories of Japan for the children of its women employees. This factory provides company dining rooms, store—even swimming pool as well.

Transmission Branch started talking in terms of impedance instead of resistance, and doing other queer things, the demand for computresses in that particular branch became so great that several girls were definitely assigned to transmission work as calculators. This, then, may be considered the beginning of real laboratory work for women.

In addition to computing and making electrical measurements and transmission tests, girls are also employed in the Transmission Branch on draughting and on follow-up work on jobs placed in the Model Shop—the last mentioned a most important and (with all due respect to the Production Branch) rather trying task.

The other laboratories were quick to realize the value of women for certain kinds of work, so they, too, began to cast around for suitable representatives of the female of the species. In the Physical Laboratory the experimental work on switchboard lamps and on filaments in general required deft fingers as well as agile brains.

Recently there has been a great demand for

WOMEN IN THE ELECTRICAL FIELD

Miss Gertrude Tucker, secretary to the president of the Southern California Edison Company,



has had much to do with the progressive work being carried on by that organization in regard to the education of its women staff into company ideals. With the importance of large numbers and higher positions, criticism of women's work in the electrical field is becoming constructive—and employers are recognizing that hitherto they simply have not taken the trouble to make good employees of their women workers. Among the pioneers in this constructive work should be counted Miss Tucker, who has helped organize the series of talks and women's meetings now being carried on by her company.

THE OPEN DOOR OF THE PACIFIC

(Trade with Asia has maintained a satisfactory level and although it suffers as all foreign trade must from difficulties of delivery and the export situation, it contains elements which point to a very prompt response when war conditions shall be removed. The telephone situation in Mukden is typical of the Orient—in rather poor condition with cheap equipment but about at the stage where improvement is necessary—and looking to America for better ware.—The Editor.)

AMERICA'S INCREASED TRADE WITH ASIA

The annual report of the chief of the U. S. Bureau of Foreign and Domestic Commerce, recently issued at Washington, gives figures of the enormous increase of American trade with Asia during the first ten months of 1917.

From Asia the imports into America for the ten months were \$634,363,292, as compared with \$437,286,584, showing an increase of 45 per cent; while the exports from America were \$330,604,173, against \$287,364,051, or an increase of 15 per cent.

Of course, American foreign trade as a whole has the enormous advantage of being able to show a huge credit balance. The excess of American exports over American imports for the ten months ending with October amounted to the colossal sum of \$2,646,000,000, or more than the sum total of the imports for the same period.

TELEPHONES IN MUKDEN AND CHANGCHUN

The American Consul at Mukden, China, reports that a considerable demand for telephone equipment has arisen at both Mukden and Changchun. The Chinese have a telephone company at each place, but the installations are too small, and more telephones, wire, and other supplies are needed. The demand for telephone service in this district is constantly growing, and a favorable field is offered in this connection for American exploitation. The Chinese have been buying a cheap and inferior class of telephone equipment, but they are now convinced that it pays to purchase more substantial and durable material and are anxious to buy from Americans.

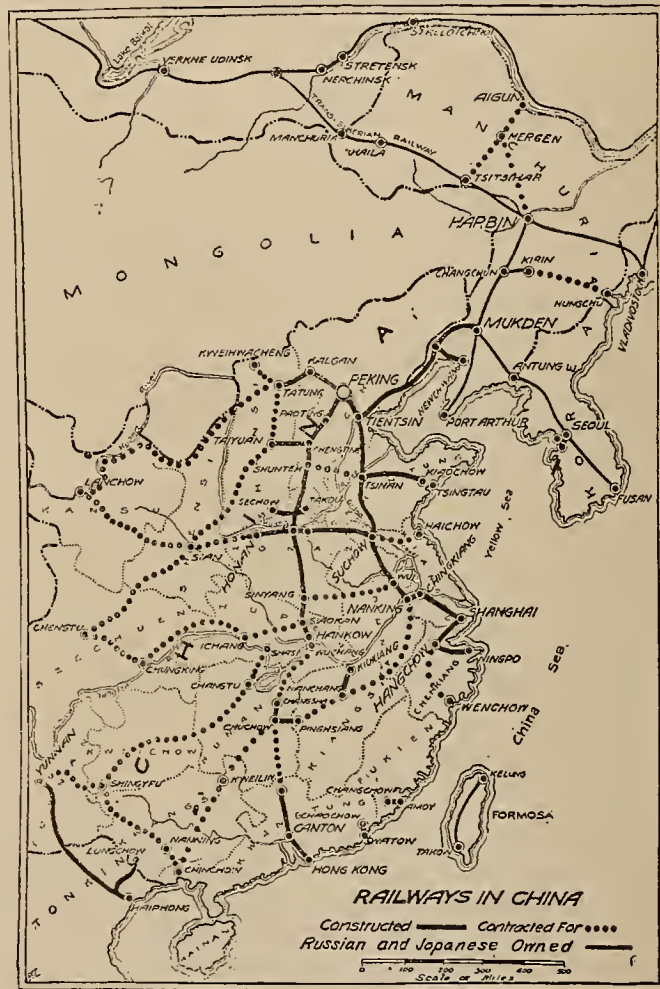
The method of placing American telephones—and any other supplies, for that matter—should be in keeping with the class of goods offered. First-class selling methods should be employed for first-class goods. A fair share of the trade will never be obtained without personal representation. The manager of a local telephone company states that he is in a position to buy about \$50,000 worth of telephone material, but that he will only do so after conferring with an actual representative of some manufacturing firm.

Mukden Telephone System

The Chinese telephone system at Mukden is owned and operated by the provincial government and has about 900 phones in use. The system maintains both local and long-distance services in South Manchuria.

There are fifteen telephone systems in various places in the Mukden district, owned and operated

by native merchants and three by the Chinese Government, all of which now possess Japanese tele-



PROGRESS IN CHINA

The extent of civilization of a country, a true index of its use of electricity and electrical devices, is dependent in a large measure on the ease of transportation. Note the spreading network of railways in China. The map is reprinted from Asia Magazine.

phone equipment. All of these systems are said to be run with common magneto batteries.

AMERICAN COMPETITION WITH OTHER COUNTRIES

China offers a growing market for various types of machinery. As a rule, however, the Chinese in Hunan who need or may desire this machinery are unable to deal directly with American manufacturers in the United States. The language is the most important factor in producing this situation. Catalogues and letters in English with their cabalistic signs describing machinery and prices f. o. b. some city in the United States which is unknown to the average Chinese are almost utterly useless.

Banking and the Exchange Problem

The lack of adequate banking facilities and the exchange problem also are factors. The average Chinese merchant at Changsha finds it well-nigh impossible to establish credits in the United States to cover purchases, because of exchange conditions. As business is on a silver basis, purchases must be made and paid for in gold, and experience shows that he is likely to have difficulties if a sudden fluctuation occurs in the exchange value of silver between the time he sends the order and the time he receives his machinery. For this reason he prefers to go to locally represented foreign manufacturers who understand his condition, who know him or can find out about him, and who will give him fairly liberal terms to enable him to buy. The foreign representative also is an expert in exchange, and is able to take the risks attendant upon purchases of this sort, and thus save the Chinese merchant the incidental worries.

Another factor is the general lack of knowledge on the part of Chinese merchants of foreign machinery and its uses. The merchant or miner knows that foreign machinery exists and that it may be purchased, but it is a very different proposition for him to be able to tell what kind of machinery he should have to meet his special needs and how much should be purchased.

Experience of a Mining Company

A mining company which is engaged in the extraction of gold from quartz had been operating with profit by using the native stamp mills run by hand or by weak water power. It was decided to put in a foreign stamp mill, and one was ordered. It arrived at Changsha, was taken to the mines and there installed, when it was discovered that the cost of fuel to run the powerful stamps was so great that it did not pay to use them, and so they stand unused today.

Of course, the Chinese merchant is becoming better equipped as time goes on. Young foreign-trained Chinese engineers are being employed, and they are learning by experience to draw up proper specifications for new machinery which is needed, but the time has not yet come when the Chinese merchant can order direct from the United States without risk. As a result he prefers to go to the local representative of a foreign manufacturer and order machinery through him.

German and British Representatives

It has been the practice of our German and British competitors in this field to have on the ground experienced engineers, who can investigate the needs of the Chinese merchant and give him advice as to the kind and quantity of machinery that he needs. Generally speaking, these firms also export Chinese raw products, and through the assistance given them by their own banks they are enabled to offer easy credit terms to the Chinese merchant.

WAR CONDITIONS AFFECT CHINESE TRADE

Imports of machinery of various sorts into the South China field during the past year have been

disappointing, according to the American Consul at Hong Kong, but on the whole the decrease in trade has been due as much to conditions as in the United States and Europe as to conditions in Hong Kong and various Chinese ports. In various districts about Hongkong political and other troubles have so unsettled conditions that new enterprises are undertaken only with reluctance, and a normal demand for machinery in all lines can not naturally be expected. On the other hand, orders for various lines of machinery actually placed abroad have not been



Methods of transportation in the Orient are not wholly electrical

filled because of war restrictions or because of general conditions in the trade.

Delay in Delivering

An electric-light and power company in Hongkong has been waiting for many months for engines and dynamos for its new power plant ordered in Great Britain. The company lately has been considering the matter of purchasing its machinery in the United States, but so far no decision has been reached, and it is doubtful if the plant could be secured in the United States under present war restrictions. In the meanwhile the company can furnish no increase in its service and has prohibited the addition of any power machinery on its circuit. This has prevented trade in electrical machinery for local use for some time and will prevent the importation of any such machinery until additional electric current may be had. All over South China small electric-light and power plants have been introduced, but most of them need replacing or overhauling, which can not be had at the present time because of high prices, high freights, and the general embargo on such machinery. The trade in motors, mostly marine, is being greatly influenced by the increasing success of Chinese and other local manufacture of ordinary internal-combustion motors and engines. Much of the ordinary trade in this line will in the future be local. What actually can be done in Hongkong in this line may be appreciated from the fact that all engines, dynamos, motors, and even propellers and mountings for a 10,000 ton ship launched in Hongkong some time ago were made locally.

What machinery has been imported during the past year has been very largely American.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(With the increasing development of hydro-electric power, the problem of water right values is coming to be one of the important items in valuation and utility rate cases. As the practical value of the water right is obviously dependent on the earnings allowed upon it by the courts, the establishing of a definite policy would relieve experts and regulating bodies of much embarrassment. A careful analysis of the rights of the case is here made by an engineer who is a recognized authority in valuation matters.—The Editor.)

THE VALUE OF THE WATER RIGHT IN ITS RELATION TO THE RATE BASE

In concluding the foregoing article a reference was made to the economic value to society which results from the development of the energy in flowing water. Any one who engages in the business of controlling and marketing this energy deserves not only adequate protection of his investment, but also some reward for doing that which conserves other valuable natural resources.

Under this view, even when the water right which makes the development of power possible would appear to be without market value at current fuel prices, it will be reasonable to allow to the owner not alone a rate-base increment equal to the cost of securing the water right, if there has been any such cost, but also, if this cost has been legitimate and reasonable, a fair excess allowance in the earnings, perhaps proportional to the amount of power developed rather than to the actual investment in works for developing and marketing this power. But this can only be done within limits or so long as the rates for the service remain reasonable. When it would require excessive rates, the owner must suffer the penalty of having made an untimely if not an unwise investment.

It seems hardly necessary to add that the national and state policy should be to grant liberal terms, and even to assure a bonus in special cases, to those who in proper manner and on a scale commensurate with physical conditions and with industrial and other requirements will enter upon the development and marketing of the energy in the flowing stream. The wise policy would be to grant terms which will assure a fair profit, but under which, after a reasonable time, preferably about 50 years, which is a short period in national and state life, the control of the water power and the power plant itself with all accessories will revert to the government, so that then, if it appears desirable, new terms of use can be agreed upon. By such a liberal policy the early development of water powers will be assured and the utilization of energy which nature annually replenishes will help to conserve that which must otherwise be obtained by the inefficient consumption of a limited store of oil and coal.

Additional Illustration of Strategic Value

As an illustration of special water right value the case of a water supply for general and domestic use may be taken, which affords water of prime quality in limited amount, but which, when compared with other sources in use in the same community, has the advantage of proximity, elevation and reliability of service.

Let it be assumed, for example, that such a supply

was the first to come into use, that its water was distributed, as required, throughout the built up section of a growing town, but that at length a time came when additional water had to be brought in by a second system from some remote source, and that, at the time of a valuation for rate fixing, the distributing pipes of each of the two systems cover practically the entire built up territory. The original water works may now be supplying only a small fraction of the aggregate amount of water being used. Undoubtedly under such circumstances, the charge for water by the two concerns would be the same, or very nearly the same. The water from the newer works could not be supplied at a low enough rate to drive the earlier concern out of business. Without any reduction of rates, the original utility should be considered as a privilege similar to a franchise and should be treated accordingly.

It must be remembered in this connection, however, and in any analysis of this character, that the advantage that one concern may have over another in the excess of net earnings compared with interest on the investment, is to be applied to all elements of value in excess of the capital actually invested and can not always, as above assumed, be assigned to water rights alone.

The Life of the Right Affects Its Value

The water right as thus far discussed applies particularly to the right to put water to a continuing beneficial use without limit as to the time during which such right may be exercised. There will be cases of reversion of the right within a fixed time to the people who have made the grant thereof and there will be other cases in which a superior supply of water, later to be developed, may at some time throw the original source out of use altogether or leave it available for only inferior uses. Where a water right thus or otherwise limited in its life is to be valued, the question not only arises as to whether it has strategic value, but also what effect time will have upon the value.

Earnings Create Value

The value of any water right in excess of its cost, like the value of a franchise, results as already stated, from earnings in excess of ordinary interest on the investment. This value is, therefore, directly dependent upon the rates established by the rate fixing bodies, or in the case of operation under a franchise, upon the rates limited by the terms thereof and limited by the further requirement that they must not exceed 'what the traffic will bear.' Large power is in the hands of the rate fixing authorities to make or to destroy the value of water at its source and until a definite policy has been adopted by such authorities,

there will continue to be more or less uncertainty relating to such value. The real value of property of this character will, for the present, remain somewhat speculative, particularly in cases where the development of the water or of a water power lies in an uncertain future. This can hardly be otherwise because it is not yet certain that the tendency of today to allow something when value is made the rate-base for the water right in addition to cost will be adhered to. When it is generally understood that such an allowance, practically as compensation for making the development, will be made and when the amount thereof to be expected under ordinary circumstances can be approximated, the valuation experts will be relieved of much embarrassment.

In the case of the established utility, much of the difficulty ordinarily encountered when water rights or franchises are to be valued will fall away if the method of procedure in fixing rates which the writer recommends be followed and the invested capital and not present value be made the rate-base.

The San Francisco Rate Case

Since the above notes on the value of water rights were written the report of the Standing Master in Chancery, Mr. H. M. Wright, in the case of the Spring Valley Water Company vs. City and County of San Francisco (rate case) has been filed with the court (Oct. 17, 1917) and merits notice. The Master says on the subject of valuing water rights:

"The valuation of the plaintiff's water rights is considered by counsel for both parties the most difficult single subject in this litigation. * * * There is little or nothing in the way of decided cases to afford a guide to the principles of such a valuation."

In speaking of the value assigned to a right of property, additional to that of the land and structures which its exercise requires where it cost nothing as a historical fact, the Master says:

"Such is, in essence, and often in fact, the right to appropriate water. I have been especially struck with this peculiarity of this right of property because I have never seen anything like it among the various rights of property or elements of value that usually enter into the properties of a public utility subject to appraisal. Usually the elements of value have been the result of expenditure, and would cost money to reproduce; or, if they cost nothing as by gift or adverse user, would be the subject of estimated cost in the reproductive method. Here in any view, the right arises by the act of diversion. Like the miner's right, it is a valuable right conferred by the United States, and in the case of water by the State also, to him who finds and takes. And just as the miner has in his mining claim, after discovery and location, a property which may possess value in exchange far beyond his expenditure of labor and money thereon, so the appropriator has in his right of diversion, a right separate from his rights in lands and structures, and which may in a given case have a sale value far beyond his expended costs. And in the normal case, the value upon which rates can be earned is the exchange value in the market."

The doctrine of riparian rights was established in California as a rule of law when the State Legislature in 1850 declared that:

"The common law of England, so far as it is not repugnant to or inconsistent with the Constitution of the United States, or the Constitution or laws of the State of California shall be the rule of decision in all the Courts of this State." Referring to this fact the Master says:

"It may be doubted whether by intention of the legis-

lators of that early day, or by the language employed, the riparian law was established along with the antithetic existing water system of appropriation. We need not follow the history of this question as to the existence of the riparian rule in this state through the years; it was established as the law in the common law form of statement, by a divided court in the great case of *Lux vs. Haggin* (69 Cal. 255) decided in 1886."

The Master then calls attention to the fact that in certain substantial respects the application of the riparian doctrine has undergone extension and modification since the *Lux v. Haggin* case was decided. It has been extended to apply to underground waters and as against an appropriator from a stream to the owner of non-riparian land overlying gravel supplies fed by that stream. It has been modified so as to restrict the riparian right to limits defined by actual or possible beneficial uses upon the riparian land. After further discussing the rights of the riparian owner the Master continues:

"I have reviewed the law of this state underlying the anomalous situation arising from the existence of two radically inconsistent systems of water law as a basis for concluding that in valuing a right founded on appropriation we will reach correct and consistent results if we disregard all attempted distinctions drawn from controversies between riparian proprietors and appropriators; in other words, value the right as if the riparian law had never been in effect."

Without attempting to follow the reasoning of the Master at the full length at which presented in the report, it may be stated that in conformity with the view held by the courts that fair value must be the starting point when the sufficiency of earnings is in question, the Master holds:

"That the fair market value of plaintiff's rights of diversion, as a whole, during the respective years here in question, is the proper standard of valuation for rate fixing purposes; that the extent of the right is to be measured by the extent of its utilization, that is, the yearly supply to San Francisco in any year, less the amount derived from the Pleasanton sources" (underground waters); "that the Pleasanton supply is properly included by an allowance, in the capital value, of the market value of the Pleasanton lands as a whole."

Giving weight to the evidence submitted in this rate case including the facts in a local recent transaction which included the right to 1,000,000 gallons of water per day and to the findings of Judge E. S. Farrington in the earlier Spring Valley Water Company rate case in which a value of about 63,500 per million gallons of daily delivery was found for 1903, the Master reaches the conclusion that the unit water right value to be applied to the actual draft of water from the various sources of supply in use by the Spring Valley Water Company was \$75,000 per million gallons per day in the years 1907-8 and 1908-9; \$80,000 in the years 1909-10 and 1910-11; \$85,000 in the years 1911-12 and 1912-13 and \$90,000 in the years 1913-14 and 1914-15. This valuation applies to amounts of water ranging from 26.5 million gallons per day in 1906-7 to 34 million gallons per day in 1914-15. It does not apply to from 5 to 7 million gallons of water per day obtained from the Pleasanton wells whose value was included by the Master in the market value of the Pleasanton lands whose ownership was acquired to secure the water.

FUEL OIL AND STEAM ENGINEERING

(Conservation of fuel oil is a matter of vast importance in the West. One of the best ways to accomplish constructive conservation is to more intelligently burn the oil in the industries. Here is an article by the technical adviser for the fuel oil administrator of California, who is on the engineering staff of the U. S. Bureau of Mines. The movement deserves the strongest support from all quarters.—The Editor.)

THE NEW FUEL OIL PLEDGE CARDS

BY J. M. WADSWORTH

The United States Fuel Administration empowered to administer and conserve the nation's fuel resources is confronted with tremendous problems allied to a part of nearly every industry. To a great extent, its success is contingent upon the voluntary support accorded its work by the public and users of fuel.

Prodigal waste of our fuel resources is apparent in the industries at all sides—due in part to rapid growth overshadowing plant economy consid-

Meetings are arranged, where trained men give talks, illustrated by instructive motion pictures, showing proper methods of firing and eliminating wastes. Engineers are inspecting plants, meeting

PLEDGE CARD FOR UNITED STATES FUEL ADMINISTRATION

Prepared by J. M. WADSWORTH of the United States Bureau of Mines

Owner's Pledge

Operator's Pledge

1. Install recording instruments; they make possible an accurate knowledge of plant operations, and will pay for themselves.

2. Institute bonus system of firing contingent on minimum CO₂ reading from flue gas analysis.

3. Do not be misled by efficient boiler performance into regarding your entire plant efficient. The greatest losses occur in utilization of steam and the heat of the steam should be conserved to the fullest extent by the efficient operation and selection of machinery.

4. Chart daily plant performance.

5. The installation of feed water heaters, economizers and superheaters for regenerating waste heat where possible, are strongly recommended and will pay dividends.

6. The insulation of steam piping.

7. Recovery of latent heat from exhaust steam.

8. Preheat air for combustion requirements.

9. Do not use boiler compounds where outside treating plants are feasible.

10. Adopt a burner to meet your furnace requirements.

11. Determine proper temperature to heat fuel oil for viscosity permitting maximum burner capacity. Do not heat above this.

12. Efficient plants evaporate 14-16 pounds water (from and at 212°). Does yours? Thermal efficiency of 74-84%.

13. Recognize the value of the fuel engineer in the economical operation of your plant.

14. Study the pamphlet issued by this administration on application.

1. Watch air admission—a hazy stack ordinarily indicates more economic conditions than does a clear stack.

2. Get CO₂ reading on flue gas. If possible, to determine position of air and stack dampers for different operating conditions.

3. Remember forced firing means high stack temperatures and consequent waste.

4. Systematically clean boilers and settings. No boiler is an efficient steamer when fired through sooty or scaled tubes.

5. Remember it requires 18-20 hours to heat boiler settings to their maximum temperature. Avoid unnecessary shut downs.

6. Study pamphlet issued by this administration on application.

7. Welcome the bonus system of firing, as it puts the matter of firing on a business basis.

8. Watch steam requirements by main machinery. Immense wastes are attributable to radiation, friction and condensation in the utilization of steam.

9. Regulate the feed water to uniformity where possible.

10. Save exhaust steam and recover the latent heat from it.

11. Note the furnace condition. If heating surfaces are too close to the fire proper combustion is not possible.

12. Do not overheat fuel oil. The point where the viscosity allows maximum capacity of burner is the proper point.

13. Be sure your plant records are accurate for your own protection.

14. Watch the boiler setting for possible air leaks.

15. Co-operate with your employer in this campaign. It means more money for both of you and is a patriotic act of conservation.

KEEP THIS CARD FOR REFERENCE

The foregoing is the pledge you have signed to aid your Government in Conserving Fuel Oil.

"MAKE EVERY GALLON COUNT" and aid the United States Fuel Administration in the good work that it is doing.

erations, but very largely due to lack of appreciation of engineering principles in plant design and operation. The combustion of fuel for the conversion of its stored heat energy to useful work is a science requiring the application of engineering skill and knowledge for economical and successful results. Not all users of fuel possess this knowledge to the extent desirable for best practice.

Recognition of this led the Fuel Administration to inaugurate an immense educational campaign in which the services of the engineering profession have been recruited for the wide dissemination of skilled advice and correction of present wastes.

NAME OF COMPANY

PLANT PURPOSE

LOCATION

1. Name and type of boilers used

Manufacturer, Water tubes or fire tubes

2. Number installed

Number in battery, Number of batteries

3. Complete description

Number, length, size, and thickness of tubes and headers

4. Superheaters

Make, type, and heating surface

5. Economizers

Make, type, and heating surface

6. Feed water heaters

Make, type, and heating surface

7. Water softeners

Make, type, and heating surface

8. Main machinery driven

Complete description—size of engine—what pressure under and exhausting to what press.

9. Auxiliary machinery

Make and size of oil and feed water pumps, electric light generators, etc.

10. Stack and setting

Size and height of stack—material—number of passes in setting for gases.

11. Recording instruments in use

Pyrometer, draft gauge, CO₂ meter, etc.

12. Shift and number of operators

Number of men and length of shift

13. Daily plant requirements

Gallons of fuel oil, its gravity and flash; gallons of water.

14. Daily production of plant

In units of article made

15. Operating temperatures and pressures

On boilers and machinery driven and all regenerating machines (4, 5, 6).

16. Total length and size of steam lines

All main steam lines and box much insulated.

17. Cooling system

Description of towers, amount of water cooled, temperatures, etc.

18. Contemplated increase of capacity and improvements

Size of future plant units contemplated for addition. Why?

19. Where do you think biggest fuel waste is in your plant?

Answer fully

20. How can it be remedied?

Answer fully

NOTE: For a separate sheet for answers where necessary, noting number of item.

Questionnaire for the Power Plant

the operators, and conducting efficiency tests to encourage and foster the work. Instructive literature is being distributed to the industries, and the support of the public solicited.

Users of fuel are eagerly taking advantage of the opportunities offered. The fostering of this work primarily as a war measure, cannot fail to react to the permanent and lasting benefit of the industries.

The Petroleum Division of the Administration has work of extreme importance. Oil fuel must be supplied to our navy and the allies, for oil fuel is essential to maintain an invincible navy. Also vast quantities of petroleum products must be supplied by the oil fields of the United States for motor trucks, airplanes, ambulances and other war service.

In 1917, the consumption of petroleum in the United States exceeded production by 5 per cent. This year the difference will be much greater, and must be made up by more economical use of the product at home, as well as intensive development work. To this end the whole-hearted support of the public is vital.

The California Fuel Administration has begun a pledge card campaign to initiate their educational work. A facsimile of the card is printed with this article and the promptness with which the signed pledges have been returned is very gratifying and encouraging.

In connection with the pledges on the card, the Administration will distribute a pamphlet on Oil Fuel, compiled by the United States Bureau of Mines, which contains information of frequent use to oil engineers and amplifies the suggestions on the

card. This pamphlet is now in press and may be had very shortly upon request to the California Fuel Administration.

The cards returned form an index to all the industrial plants of the State, and furnish sufficient information about the plants to assist the Administration engineers in locating plants requiring attention. A capable combustion and steam engineer will visit these plants to make a detailed study of them in an effort to reduce fuel oil requirements. This work will be done in co-operation with the owners and operating force. The owner will receive the benefit of engineering advice in the plant operation, and the operating force the privilege of putting their problems up to a specialist in this line of work for solution.

Finally, it is hoped that the various plants signing pledges will submit monthly statements to show the amount of fuel oil consumed per unit of the manufactured article, or of steam generated, during that month. In this way each plant will be encouraged to watch their requirements, and the Administration acquainted each month with tangible evidence of the work accomplished.

FUEL OIL STORAGE

During recent months considerable investigation has been made looking toward conservation of fuel. In California, Governor W. D. Stephens appointed a notable committee consisting of Max Thelen, who is president of the California Railroad Commission, as chairman, David Folsom, professor of mining at Stanford University and Pacific Coast fuel administrator, and Eliot Blackwelder, professor of geology at the University of Illinois, in order that a study might be made of the conservation of fuel in the West. During the latter part of 1917, this committee made an exhaustive report and dealt with the situation in a masterly manner. So important are its findings, that the conclusions and recommendations of this committee are here reproduced in full:

Crude oil stocks in California have fallen from 57,147,000 barrels on December 31, 1915, to 44,036,000 barrels on December 31, 1916, a reduction during the year of 13,110,000 barrels, or 23 per cent.

Standard Oil Company reports that during the first five months of 1917 the field and pipe line crude oil stocks of all companies were further depleted as follows:

1917—	in Barrels.
January	976,036
February	1,031,960
March	854,333
April	1,197,475
May	1,355,318
Total	5,415,122

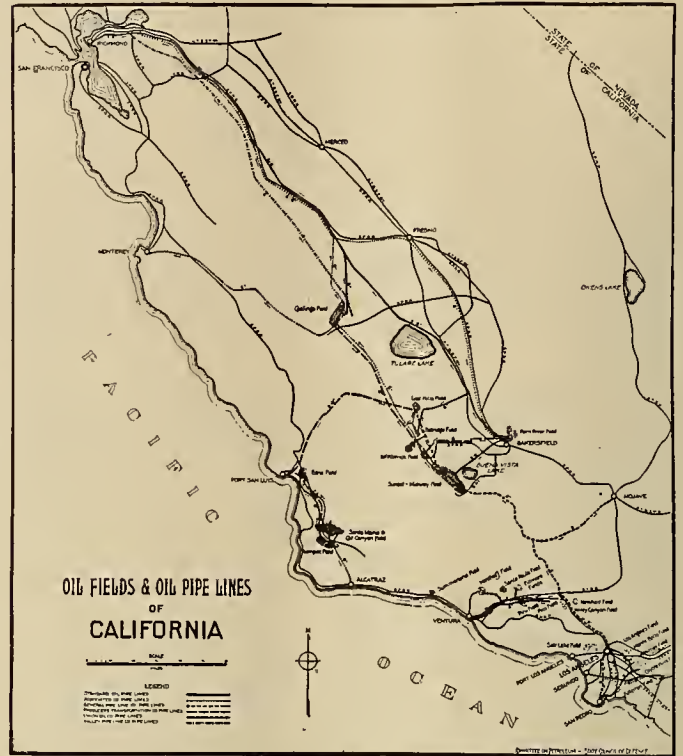
The total remaining storage on June 1, 1917, is reported to have been slightly in excess of 38,000,000 barrels.

A portion of the crude oil in storage can not be utilized because it is located below the outlets of tanks and reservoirs or is being used for the operation of oil pipe lines or for other reasons. Of the total stocks on June 1, 1917, not in excess of 32,000,000 barrels were available for use. Of this amount, 12,000,000 barrels were refining oil and would yield approximately 7,000,000 barrels of residuum. On June 1, 1917, there were available from crude oil stocks approximately 27,000,000 barrels for fuel.

If the present excess of consumption over production, amounting to an average of 1,083,000 barrels per month, con-

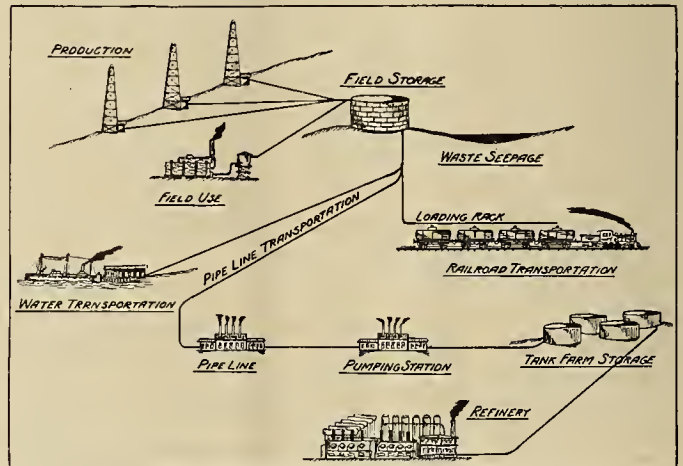
tinues, the entire available storage of California fuel oil will be exhausted by June 1, 1919.

If a margin of safety of 10,000,000 barrels of fuel oil is maintained, and if the present relationship between production and consumption continues, the margin of safety for fuel oil will be reached by September 20, 1918.



The Oil Fields and Pipe Lines of California

If consumption is materially increased, as seems likely, both because of normally increased requirements, as well as the extraordinary requirements of the war, or if production decreases, as seems likely unless the relief herein recommended is given, both the margin of safety and the complete depletion of all California stocks will be reached considerably prior to the dates indicated.

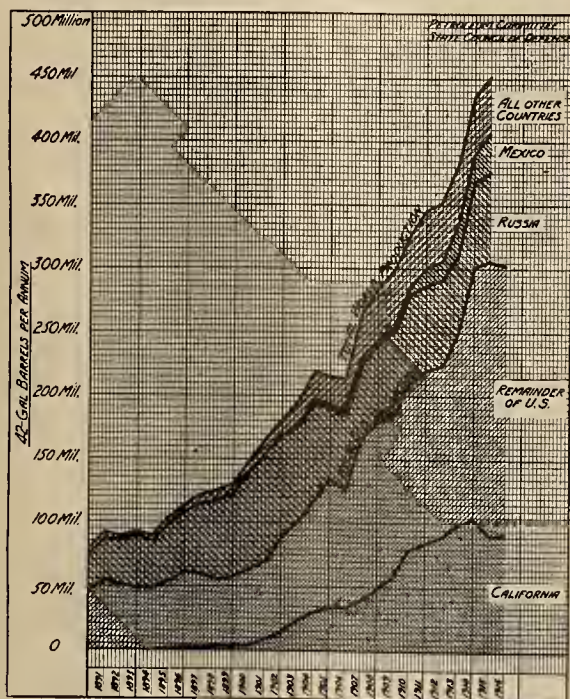


Diagrammatic Representation of Refining the Product

The principal railroads of California, with the exception of the Southern Pacific Company, have made the necessary arrangements to meet their requirements for at least one year.

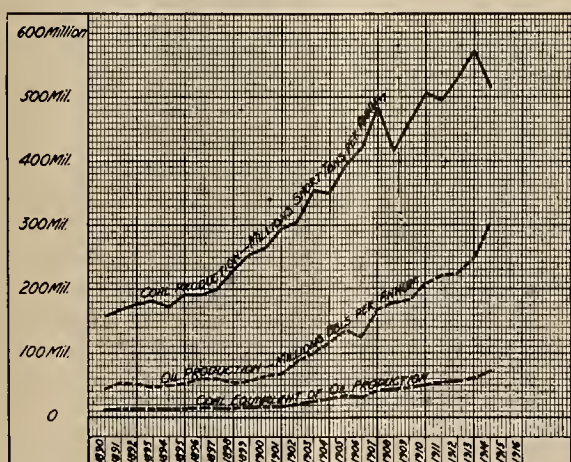
At the present rate of production by Kern Trading and Oil Company, the Southern Pacific Company's fuel oil bureau, bearing in mind also the purchase of fuel oil by the Southern

Pacific Company, including 1,000,000 barrels bought from Union Oil Company and not as yet drawn on, and bearing in mind also the Southern Pacific Company's consumption of fuel oil, the Kern Trading and Oil Company's storage of fuel oil will be exhausted by December, 1917, unless the recently augmented drilling operations of Kern Trading and Oil Com-



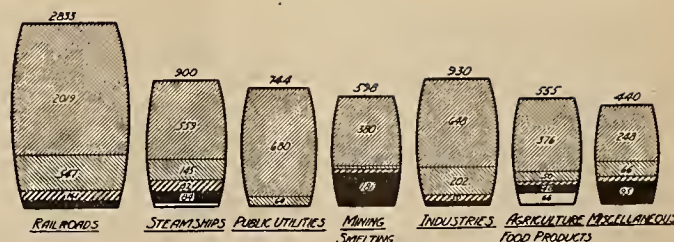
Graphical Display of Petroleum Production

pany increases the Southern Pacific Company's production and unless the Southern Pacific Company effects a substantial saving of fuel oil by converting to coal those portions of its system which are located in proximity to the coal fields of Washington, the Rocky Mountain States and New Mexico. If the receipts of fuel oil by the Southern Pacific Company decrease or its consumption increases, the depletion of its stocks will occur before December 1, 1917.



Comparison of Coal and Fuel Oil Production

If the Kern Trading and Oil Company's storage should be exhausted, it would be necessary for Southern Pacific Company to enter the market to purchase oil from general stocks in storage, which amounted on June 1, 1917, to slightly over 38,000,000 barrels. These stocks are owned principally by Standard Oil Company and Union Oil Company. If these companies should be unwilling to sell to the railroads fuel oil from their storage, we assume that the federal government



Comparative Uses of Crude Petroleum

would have the right to commandeer the stocks and to compel their delivery for the operation of the railroads as long as the stocks hold out. Such action, if on a large scale, would necessarily deprive other important industries of petroleum and its products.

RECENT EXTENSIONS IN CHINESE POWER PLANT

The normal growth of Canton as a leading center in south China and its prospects for the future have led the Kwangtung Electric Supply Co. to decide to increase the capacity of its plant. A contract was signed recently with a firm of American engineers and contractors for the purchase of two American high-pressure noncondensing turbo-alternators, rated 2,500 kilowatts, three phase, 60 cycles, 2,300 volts; one American high-pressure noncondensing turbo-generator, 35 kilowatts, 125 volts, direct current; switchboards, pumps and other accessories. The contract also calls for four 750-horsepower Babcock & Wilcox boilers.

Demand for Electric Power

The extension of the plant under this contract will be made with the object not only of supplying the city and its environs more extensively with light, but also of furnishing electric power for the various industries that have developed here during the past few years. As new customers were continually presenting themselves, the increase of business called for additional equipment. The project for enlarging the installation, however, was postponed from time to time, on account of the scarcity of freight space, the increasing cost of coal, and the rising price of electrical machinery, fittings, and materials, all of which are manufactured outside of China. When the additional machinery and supplies are installed the Canton plant will be the largest in China except at Shanghai.

In addition to Canton, electric-power plants have been installed in many other cities and towns of this Province and of the neighboring Province of Kwangsi. The present enhanced prices of kerosene are greatly adding to the number of electric-light patrons, and insure good prospects for these ventures. The electrical equipment of the installations was purchased for the most part in the United States, while the engines came from England.

The subject of future power development in all parts of China is a question of vital interest to the future growth of the republic. Native coal fields are known to exist in many sections of China but the prolific water powers of the great interior possess such untold possibilities for future development that other sources of power generation fade into insignificance in comparison.

BUSINESS BUILDING

SELLING IDEAS

DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS

COST KEEPING

ESTIMATING

ODDS AND ENDS OF SELLING PSYCHOLOGY— THE GENUINE BARGAIN

BY H. A. LEMMON

(The principle of the genuine bargain is at the bottom of all sales—that is, you always sell your customer what he thinks he wants more than the money he parts with. A realization of this principle should determine the effectiveness of advertising. The author of this entertaining article is sales-manager of the Truckee River Western Electric Company of Reno, Nevada and a specialist in advertising matters.—The Editor.)



There are times when a very little thing may seem worth all you possess.

SAU traded his birthright for a square meal. He was weary and hungry. He probably fully appreciated the value of his prospective property rights; but at the time his mind was so influenced by pressing necessities that the birthright dwindled in perspective until its value, compared with that of a dish of breakfast food, sank into insignificance.

Brother Jacob selected the psychological moment to put over the swindle and it is interesting to learn that having done so developed into a most

capable horse-trader and trickster, continued to wax fat, happy and prosperous, and become a leader of his people, besides having a ladder named after him.

Grand juries and police courts are more of a pest these days to men of the Jacob type than they were in his time, so we can hardly adopt his methods and continue in the pursuit of liberty and happiness, but that transaction comprises the first recorded application of a great principle which plays a part in almost every sale of electrical devices—the one of relative values as between service and money. And though we may question its ethics as applied by Jacob it now constitutes the one legitimate genuine bargain principle of modern, honest salesmanship.

Like Jacob we endeavor to make other considerations outweigh the one of a certain number of pieces of money. We offer the housewife a suction cleaner. Perhaps our price is \$35. To make the money appear insignificant by contrast we elaborate the satisfaction and convenience which possession of the cleaner will give until finally the machine appears more desirable than the coin; then we swap possessions. If we have not misrepresented—and misrepresentation is a confession of mental poverty—we have conferred a favor upon our customer by arousing her imagination until she makes the purchase.

It is as though two moving picture films, one of the \$35 and the other of the cleaner, were being projected upon a screen at the same time. Neither would stand out clearly enough to be identified. As salesmen we endeavor to shut the light off the machine which is projecting the money so that nothing but the device will be distinguished. We first seek to accomplish this by substituting for a mere picture of the device itself, one of it in use in her own home. We study our lady and decide quickly,—and let's hope unerringly—whether a saving in time or labor will more strongly appeal to her. Or it may be

Your task as an advertiser is to make the picture of the dollar sign which is in the customer's mind, fade out and leave only the vivid impression of the comfort she is going to get out of her electric iron or vacuum cleaner.



because a neighbor has one, or perhaps she feels that the baby gets too much nutriment out of a handswept carpet. We don't, however, throw on all of these pictures, because if we do we are quite likely to have a greater confusion on our screen than we started with. Having selected the right one, however, the money picture begins to recede and the home picture comes out in great distinctness. If we select the wrong one it fades back into money. Having been fortunate, however—or understanding our business, which is one and the same thing—our lady suddenly realizes that the money picture is getting dim. In an effort to recall it with all of its original distinctness she hurriedly enquires the price of the cleaner and if you give her this information the sale is likely to be half lost right there. You evade this attempt to conjure up a bugaboo by tactfully ignoring the question and painting in stronger color the home scene, until finally the screen contains nothing else and the money film is out of business. The sale is made if you have substituted the idea of service for the idea of money. You have not sold her a cleaner at \$35 because it lists at \$40, but have sold her a picture of leisure, enjoyment, cleanliness, or whatever it may be, which overshadows that of a certain number of metal discs.

Several years ago an Indian ran amuck—so the story goes—killed a number of white people, and

took to the hills with a bunch of equally unpleasant tribesmen. The army of the United States was kept busy some months trying to capture him without success.

An old fellow who didn't know enough about tactics to wear any decorations believed he could solve the problem. He had a long talk with the renegade's son who was in the army post. That Indian boy could count up to twelve. The old scout offered him five cartridges and a rifle if he would go out and bring in his father's head. The boy was an affectionate sort of a son and indignantly spurned the offer. So the scout offered him six cartridges, and seven, and so on, until he reached twelve. He



You may like brunettes where the author has described a blonde. That is why, in story writing, as well as in advertising, it is better not to be too specific in describing the picture, but to leave something to the imagination.

thought he detected signs of wavering and at this point recklessly made it thirteen. The young Indian accepted without further ado and a few weeks later brought in a sack which contained the desired trophy. The boy couldn't visualize so large a number as thirteen, just as few of us can visualize one million dollars, for example. In selling we recognize this principle by reversing it, with the idea of preventing visualization of the sum required, as in the case of the two pictures, but as the matter of price must come up some time, however skillfully we minimize its importance, we like awake nights preparing chocolate coatings for it.

The lady who bought the suction cleaner from us may have written a check. Can we believe she would as readily have parted with the thirty-five dollars had that sum been in quarters or even in silver dollars? Because the sum in its entirety is one that may compel recognition of its comparative magnitude, we frequently do not mention it at all as a total, and instead of "this cleaner is sold for \$35," we say rather, "You can do all of this in your own home by merely paying only five dollars down and five dollars a month for six months."

Being an average human being possessed of the average human mind \$35 in cash and \$5 per month for seven months represent two entirely different and not-to-be-compared sums.

A well-known hoe-type safety razor which has been nationally advertised and sold at \$5 is offered by a local dealer at \$3.50. It is only an "apparent"

bargain to a young girl. It is a genuine bargain for the man who shaves himself and chances to be in need of a razor. It is a genuine bargain to him even if he pays \$5, for in either case he is not purchasing a razor but a means of removing his beard. The girl would be merely buying a razor.

A suction cleaner in itself is but a few pounds of copper, aluminum, sheet steel, wire and fibre. How can we expect to sell such a conglomeration of junk to any intelligent woman? Yet that is just what many of us try to do. Let us instead endeavor to sell her a clean house, leisure, ease, enjoyment, etc., and see what happens.

And in picture making we must not go into too much detail. Merely a suggestion here and there. If I were to write a story, and, because you had been caught in some reprehensible act you were forced to read it, interest would probably center about the heroine. If I described her as a charming blonde, with baby blue eyes and cupid-bow lips and pale pink ears, etc., I would be attempting to force on you my ideal of a beautiful girl who probably wouldn't be beautiful at all to you. It may be that your ideal type is a brunette. At least it is certain that we will not agree on all details of feminine perfection. If on the other hand I describe her rather vaguely as beautiful, and charming and sweet, etc., then you will immediately supply the details of the picture yourself, and I will have provided you with just the type you admire. In other words, in one case my suggestions enable you to paint the picture and in the other I painted it for you. So we suggest things that will cause the prospect to picture pleasure, or the comfort or the satisfaction a cleaner will give her, and thereby inspire her to furnish the details and personal application out of her own mind and her own experience with a result immeasurably more convincing than anything we can force on her.

To state in our advertising or our selling talk (and they are one and the same thing) to a lady to whom we wish to sell a toaster that if she purchases she will no longer have to trudge back and forth between the kitchen stove and the breakfast table, to say nothing of burned fingers, etc., is painting the picture for her—in other words describing the heroine. If on the other hand we say that with an electric toaster she may sit at the breakfast table and visit with the family, we force her to paint her own picture which will include all of the things we could suggest and many more which appeal and apply especially to her. The first method is perhaps not so bad but the second is more subtle—and, well, it will sell more toasters. Incidentally we will have suggested a pleasant thing which her own mind has contrasted with the unpleasant and that is very desirable.

A NEW USE FOR A TOASTER

A new use for an electric toaster has been discovered by a hatter who employs it to heat felt pads with which he brushes his hats before handing them to the customer. This not only cleans them, but also gives them a rich, glossy surface which improves their appearance.

Western Ideas

AN INGENUOUS BUSINESS CARD which combines the essentials of name and company with a brief catalogue of business information has been worked out by F. S. Hurst of the Electric Material Company. The card represents the ordinary business card in first appearance and is in no way undignified. Attached to the back, however, is pasted a slip some six or eight inches in length, slightly narrower than the card itself, on which is printed the names and line of the various manufacturers represented by the company. This folds back upon itself in accordion fashion, very neatly, the whole thing

being held in place by inserting the edge under a little flap cut in the material of the card itself.

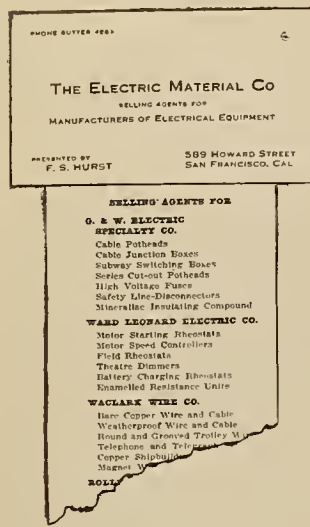
Not only is this card neat and attractive in appearance, but its very ingenuity pleases. The information is the same as that contained on the letter head of the company and is here reproduced in similar form, so that it carries out in a way the trade mark principle. The array of names is in itself imposing and no one fails to glance over the list presented in this out-of-the-way manner. The card is not bulky and takes up very little more space than the ordinary pasteboard.

ILLUMINATED POSTERS were used to good advantage by a western dealer in a recent show window as reported by Signs of the Times. Sometimes beautifully lithographed pictures are furnished by the manufacturers of window displays. This dealer was in the possession of one advertising automobile lights which showed a coast scene with a lighthouse, and an automobile travelling along a dark highway.

The ingenious window decorator conceived the idea of cutting out the representation of the lens and lighthouse rays, and passing some translucent white paper behind the parts that had been thus eliminated. Then he made the lithograph the front of a box arrangement in which he inserted an ordinary incandescent lamp. The result was that when illuminated at night it made an unusually forceful and attractive window feature.

Depend upon the electrical dealer to see the possibilities of linking up electricity with his show window displays. In this case electricity and lithography combined to make an improvised but none the less effective selling help.

At the same time a selling help was offered to the manufacturer.



A PATRIOTIC POSTER designed for American workers, be they miners or electrical men, has been gotten out by Edwin Higgins, consulting engineer for the California Metal Producers' Association, for use in the mines and offices of the company. It is in response to no special call, but with the idea that Americans need only be reminded of what is developing about them, to answer in all patriotism.

"I am a voice, seeking lodgment in the conscience of every true American, a voice seeking to unfold before you the unmeasurable love and devo-

TO THE MEN OF THE MINES!

I am but a voice, seeking lodgment in the conscience of every true American; a voice seeking to unfold before you the unmeasurable love and devotion that lies within the hearts of the men who will fight for this land and ours.

A million men! Two million men! More and more millions—to fight for you and yours! Can you see beyond these mere words? As these soldiers depart by the hundreds of thousands they leave behind corresponding hosts of loved ones whose brave hearts are strained to the breaking point. With every goodbye was the joy of life left trembling in the balance with a wife or a mother—the noble, unflinching, suffering mother! God bless them!

Well may the soldier's boy's going be called the "Great Adventure." For he goes not only to face the Grim Reaper on steel-swinged battle fields, he must struggle against the winter's chill, the summer's heat, mud and rain, disease, hunger, thirst, and the long, dreary nights only too often charged with torment. But do not fear: American men will carry on with the same tenacious spirit as did their forefathers on other occasions when the liberty of our land was threatened. They will carry on to a glorious end, because they know that they are fighting for their altars and their fires, their mothers and, above all, the safety of their mothers and loved ones at home.

Will you do your all for these brave American men who are offering their all for you? Let your voice be heard. Besides displaying your loyalty at all times you can help by doing any or all of the following things:

- Support the Red Cross, Y.M.C.A. and Kindred Organizations—
They work as a God-send to the soldiers.
- Stop the Waste of Foodstuffs—
Waste not even a crumb of bread.
- Buy Thrift Stamps—
Encourage your children to do likewise.
- Cut Out Wasteful Spending—
Your thrifty habits are the nation's gain now.
- Combat Unpatriotic and Treasonable Utterances—
And then report them to the proper authorities.
- Invest Your Money in Liberty Bonds—
The safe saving investment in the world.
- Give Freely of Your Time for Patriotic Endeavor—
Be sure that you receive more.
- Keep the Wheels of Industry Turning—
The most important job in the world today depends largely on the laboring man.

EDWIN HIGGINS

tion that lies within the hearts of the men who will fight for this land and ours," the poster begins and goes on to urge loyalty of thought and action and response to the many minor calls on the individual. In view of the desire of every loyal citizen to do his part and to utilize the channels of his business organization to assist the nation wherever possible, this contribution from a private organization is of particular interest.

THE PROOF OF THE PUDDING is in the eating, according to the old adage and the same may be said of electrically made toast.

A jobber in electrical appliances in one of the largest cities in the country keeps track of meetings of women's societies and clubs and where it is practicable, that is, not too costly, he asks permission to serve coffee and toast or other light refreshments that can be prepared electrically at these functions.

In a large number of cases he receives permission to do this, and is permitted further to talk on electrical cooking. This lecture, accompanied by practical demonstration, not only does a great deal to educate the women to the idea of cooking by electricity but has resulted in a large number of quick sales.

HANDBILLS are considered a nuisance by many householders, for the reason that they blow about and deface the lawn or front steps, or even the front hall of a residence and necessitate stooping and picking them up from perhaps some very inconvenient place. After the lady of the house has been forced to stoop down and remove a handbill from the dusty sidewalk—perhaps with her white gloves on—she does not feel kindly toward its originator and looks only for the nearest waste basket in which to drop it. In very few cases does the handbill get beyond the first person who enters or leaves the house after its insertion. In nine cases out of ten this is the servant or some non-purchasing member of the family who merely destroys the bill and says nothing further about it.

For this reason the suggested scheme of attaching such handbills to sharpened sticks in the form of a gay colored pennant and having these stuck into the front lawn or dooryard by the delivery boys, is a great improvement on the usual scheme. If there is a local demonstration or neighborhood sale which may be advertised in no other way than by handbills, pennants of this type will awaken far less resentment and receive more general attention owing to their originality.

LEARNING FROM EXPERIENCE is perhaps the most effective way of obtaining knowledge, but it is a less expensive method if it is possible to learn from some one else's experience. An experience of the retailing counsel of the Associated Advertising Clubs of the world in regard to shoes, might well be applied to electrical retailing and a lesson learned free of charge.

On his first visit, he found the little Western town had seven shoe stores.

This interested him so much that he made an investigation of the local shoe situation and discovered, among other things, that the cashier of the local bank and one or two other prominent men drove over to a town not much larger, twenty miles away, to buy their shoes.

The reason was apparent.

So many different dealers were attempting to handle shoes that not one of them carried a comprehensive stock, and none had shoes to suit the banker.

He showed, during the course of his Merchants' Institute in this town, that there was enough money invested in shoes in that town to provide sizes and styles for a community twice as large, yet local men and women were forced to go elsewhere to get satisfactory shoe service.

The trouble was over-lapping lines. Too many merchants carried incomplete lines that lost money for themselves, their competitors and the manufacturer who sold them the shoes.

Nobody was pushing the shoe business. In the long run, this meant that the community was buying fewer shoes, all told, than it might have bought had enterprising merchants been introducing new styles and attractive shoes in a modern way.

His talk, as he found in the community on the second visit, bore fruit. The number of shoe lines had been reduced and the amount of sales increased. Customers were better satisfied, the merchants made more money and manufacturers, of course, supplied the increased demand.

At first blush, it seems that the manufacturers should not care whether shoes were sold in this town or the neighboring towns. But as a matter of fact, the people were buying fewer shoes than they should. They were wearing shabby shoes because the limited displays were not tempting, and they used their money for other things.

The moral hardly needs pointing.

THE LIVE WIRE is something which is bright and sparking, doing business—a thing which you can't pick up and forget, but which gets under your skin, somehow, and puts you into action. For that reason these bright little announcement cards which are gotten out weekly by the San Francisco Electrical Development League are particularly well named. An attractive invitation is half the success of a meeting. Of course you may have established such a reputation for worth while programs that a mere calendar date will bring your company—or you may furnish such poor programs that no invitation

could attract a crowd, but usually the successful two go together. The spirit of good comradeship and the snappy life of meetings is a thing which is obviously read through the invitation card. The ideal card has something of dignity—for a mere circus vaudeville stunt repeated often will lose you some of your best members—and at the same time something of informality to suggest the co-operative good feeling of the gathering. It suggests something you can't afford to miss, either by way of serious information or pleasant acquaintance.

Back of the invitation, of course, must come the meeting itself. If your organization is a worth while gathering of worth while people it will have a serious purpose somewhere—a purpose that cannot be consistently neglected. Time and again the principle has been proved that it is the serious things rather than the good times which alone can hold a group of any size together. On the other hand, no group can work successfully who are not friends—and part of the serious purpose of every electrical organization should be to enjoy itself together, to foster good feeling and promote acquaintance. Half the battle for co-operation is won when both sides know each other.

THE LIVE WIRE
*Queer quips, quizzical quips, and quaint queries
 from the quiet quill driver of the
 San Francisco Electrical Development League*

"Good morning, Mr. Zip, Zip, Zip,
 With your hair cut just as short as mine."
 Now take from us a tip, tip, tip,
 And with us at the Palace dine.

Wednesday Noon, April 3rd
 ROD G. GUYETT Presents
GENERAL C. A. WOODRUFF
 in a dashing good talk full of pep, pithy and punch, on
HOW WE CAN HELP

The war will end when we have won—
 And win we will in spite of Hun
 If you and I and every one
 Will see to it our duty's done.
 No sacrifice can be too great
 To rid the world of Teuton hate.
 For other things we all must wait,
 Or otherwise 'twill be too late.

But why men shun such serious things till after Arthur
 Kempton and Fela Butte show up each other in the approved
 style of Bobby Byrne. "Would that we could see ourselves as
 others see us." These will be two fast two-minute rounds
 between Inspector and Contractor, refereed by Earl Fisher.
 The loser will have to tell how a floating population can exist
 in a dry town.

"F. S. Gray will tell what he knows about J. B. Black.
 The color scheme is too obvious for comment.
 Paul Carroll will line us up for the Liberty Bond Parade.
 Remember each meeting is better than the one before.
 You know why, Al."

San Francisco Electrical Development League
 Luncheon Every Wednesday noon, at the Palace Hotel

OFFICERS:
 PRESIDENT, R. E. FISHER, PAL. B&A ELEC. CO.
 FIRST VICE-PRESIDENT, C. H. REED, PAL. FIVE CENT STORE CO.
 SECOND VICE-PRESIDENT, H. P. PETER, PAL. B&A ELEC. CO.
 SECRETARY, "TADDOUR, J. W. RECAPATH
 EXECUTIVE COMMITTEE:
 T. J. HERRICK, PAL. ELECTRIC CO. E. O. HARRIS, GENERAL ELECTRIC CO.
 W. B. BERRY, WESTERN ELECTRIC CO. FRANK RIEBER, RIEBER LABORATORY

NEEDS PRINT, 121 MINNA ST., S. F.

COURTEOUS ATTENTION TO TRAVELING SALESMEN

BY W. R. HERSTEIN

(The traditional thing to do with an advertisement which comes through the mails is to throw it into the waste basket—with a traveling salesman to evade him. But both are a convenience provided by the manufacturer to bring the market to your doors—and both deserve the consideration you are asking for your wares from another public. The author is manager of the Electric Supply Co. of Memphis, Tenn., and well known as an authority in business fields.—The Editor.)

This paper might better be addressed to a gathering of traveling salesmen than to a convention of public utilities or retail dealers, inasmuch as the reception accorded a salesman by a prospective buyer depends to the extent of about ninety per cent upon the personality of the former and only about ten per cent upon the latter. It is safe to say that a large majority of the human race are courteous by nature, and a salesman may properly take it for granted that the customer he is approaching is a member of this majority. This circumstance immediately imposes upon the salesman the duty of capitalizing this favorable attitude on the part of the purchaser, by giving the purchaser that which he is entitled to in return, namely, a proposal worth listening to; one which will make for the benefit not only of the salesman, but of the customer as well. Selling goods is not a one-sided affair. It takes two to complete the transaction, and there must be a sufficiency of advantage accruing to both sides, in order to make it successful. Consequently, the salesman is taking an unfair advantage of the customer's friendly attitude, and is doing an injustice to any of his successors who may happen along later, if he does not feel, in good faith, that he has something to offer which, if bought, will leave the purchaser in a better condition than before the transaction took place. To deliberately waste the buyer's time, or to

impose upon him an article worth less than the price accepted, is morally wrong and impolitic; it insures an uncordial reception or an absolute refusal of audience thereafter, to the salesman involved, and reacts unfavorably upon the entire body of traveling men so far as that particular customer is concerned.

Assuming, however, that the salesman has qualified himself so as to become entitled to the respectful and courteous attention to the buyer, are there any corresponding obligations resting upon the buyer which should impel him to give the salesman a hearing?

As a Matter of Self Interest

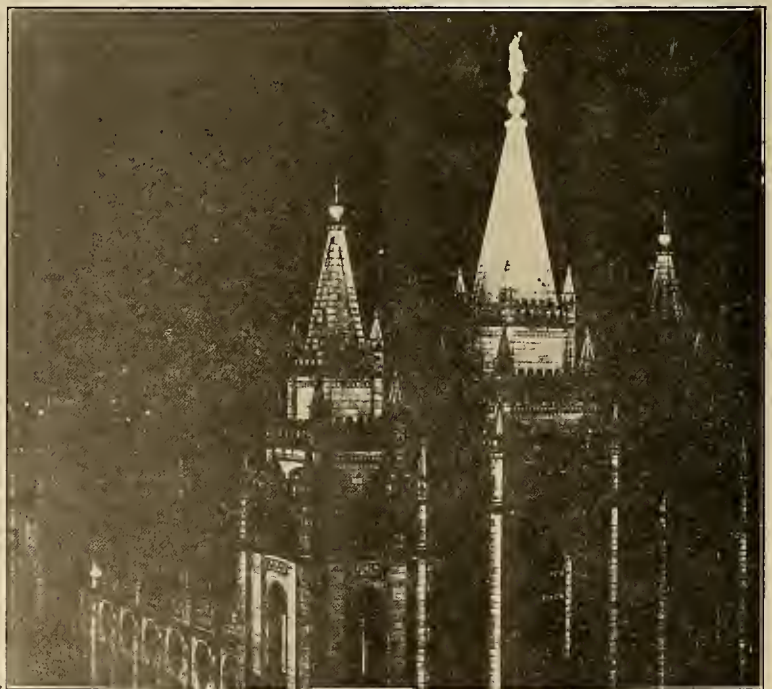
Rightly or wrongly, self-interest is one of the most powerful motives operating upon the human mind. From this standpoint alone, it is well to accord the hearing requested. Many of us have not the opportunity of visiting throughout the year, the various trade and manufacturing centers, and to a large extent, we depend upon these missionaries of commerce to keep us abreast of the times. Even were it otherwise, their thoughtfulness introduces us to many an article we might have overlooked, and brings us to a mass of new ideas they have gathered up while making the rounds of their territory. Their competitive prices enable us to secure goods at proper market values, and at the same time make it possible for us to guard against spurious, counterfeit or shoddy products offered at prices which, by comparison, arouse our suspicions. In no manner can the interests of the purchasing end of a business be more perfectly safeguarded than by availing one's self of the advantages offered by the conscientious, reliable traveling salesman.

A New Idea

From the purely ethical standpoint, the subject may be viewed in this manner; nearly all of us have something to sell, in addition to having something

FLOODLIGHTING IN UTAH

A most beautiful example of what may be done by floodlighting is illustrated in the Latter Day Saints' Temple of Salt Lake City. The effect is produced by seven G. E. type "L1" floodlighting projectors located on top of the Utah Hotel across the street. The installation was made by Eardley Brothers Company, electrical contractors and dealers of Salt Lake City.



to buy. When we step into the seller's shoes, we must present our wares either in person or by means of salesmen. If our wares are to be sold, we must receive the courteous attention of those to whom we or our salemen present them. Somewhere, I remember reading a bit of advice which has always struck me as being exceedingly sound, and which runs something like this: "Whatsoever ye would that men should do unto you, do ye even so unto them." And then again, I remember another statement which has apparently stood the test of time and which proclaims that "Whatsoever a man shall sow, that shall he also reap." How, then can we reasonably demand of the public an opportunity to present our own case, if we refuse to grant a like opportunity to the other man? How many times has every man in this audience listened patiently even to an uninteresting salesman, for the sake of his own solicitors who might possibly at that very moment be in a similar situation far away?

Personally Speaking

And then, there comes the thought that possibly the salesman who cannot command this sort of welcome seldom lasts long in one territory. If he represents a reputable house, conducts himself properly in private life, and acts squarely with his trade, it is not long before he becomes a potential factor in the community. Knocking about the world, as he does, he acquires a cosmopolitan manner and a knowledge of life and of men which make him an agreeable companion. Properly handled, his good will may easily become valuable, and it is almost axiomatic that a purchasing agent who has incurred the ill will and distrust of the travelling fraternity can not secure best results for his employer.

WIRING DATA FOR A.C. MOTORS

Helpful data in regard to wiring and protection for A.C. motors as worked out by C. U. Mitchell, electrical engineer of the Board of Fire Underwriters, is given as follows:

THREE-PHASE, 220 VOLT, ALL FREQUENCIES

Horse-power	Size of Wire Rubber Insul. B. & S. Gage	Starting Protection Capacity Amperes	Running Protection Capacity Amperes	Size of Control Switch Amperes
1/2	14	5	5	3
1	14	10	5	30
2	12	20	10	30
3	10	30	15	30
5	8	40	20	30
7 1/2	6	60	30	
10	6	70	35	
15	4	85	50	
20	2	110	65	
25	1	140	75	
30	0	160	90	
35	0	180	110	
40	00	190	120	
50	000	200	145	
60	200,000	250	170	
75	300,000	300	210	
100	400,000	400	275	

Note.—Where running protection is provided by means of overload release devices the setting of these should correspond to the figures given in the table. Where fuses are installed for running protection and it is found that none are made to correspond to figure in the table, provide trade size having capacity nearest to but greater than figure in table.

Co-operative Campaign Problems —

BY A. L. SPRING

FOLLOWING UP PROSPECTS

Contractor-dealers are continually receiving prospects referred to them by central stations. While it is true all of these prospects cannot be closed, a large percentage of them can, and everyone should be carefully followed. The number of sales to be made to these prospects is dependent upon the promptness and care in properly following them. Whenever a dealer receives a prospect, not only should he show his appreciation to the central station, but should definitely advise them what action is being taken on it. There is no doubt but that the dealer who reports back to the central station is the one who will continue to have prospects referred to him.

A few days ago I called on a dealer in a small town in Southern California, and during the conversation asked him how the co-operation was with the central station. He replied that it was excellent, that he had no complaint whatever to make and in fact claimed the co-operation had improved materially since the start of the Co-operative Campaign. He also said that the central station district agent had referred three good prospects to him that day. I then asked him if he was sure that he was doing his part in this co-operation which he was so anxious to have continued, and if he was giving these prospects his best possible service. He said that he certainly was, and yet within a few minutes from that time, the central station agent dropped in to see if he had looked after one of the prospects which should have been attended to before that time. It was found that through careless oversight on the part of the dealer the prospect had been neglected. If the agent had not kept this prospect in mind for the dealer, the customer would not have received the proper attention, would have been provoked at the central station, and the dealer would have lost the order. The dealer immediately prepared to call on this customer, and in order to get him there as quickly as possible and also to see what might be the result of this prospect, I took him, and in a very few minutes an order of about one hundred and twenty-five dollars was secured, which order would have been lost if the dealer had not been followed by the central station.

Mr. Contractor-Dealer,—the prospects referred to you by the central station must have your most prompt and careful attention, or you will not continue to receive them. The central station in referring prospects to you, in each instance, places their reputation for service in your hands, and it is of vital importance to them, to you and the industry as a whole, that these prospects be attended to very carefully. With your best possible attention given to them and a report to the central station of your actions in each case, they will continue to come to you in increasing numbers.

EXAMINATION FOR SUPERVISING ELECTRICIANS, PORTLAND, OREGON

(Stricter requirements in the inspection and approval of electrical installations are being instituted everywhere. The law requiring examination of all electricians supervising any electrical work has recently been put into force in Portland. A sample of the examination required and the results of the test of last month given below will be of interest to contractors throughout the West.—The Editor.)

The Electrical Code of the City of Portland, Oregon, provides for the examination and registration of supervising electricians. Electrical permits and the examination necessary for the supervising electricians to pass, before being registered by the city as such, are given as follows:

REGISTRATION OF APPLICANT FOR ELECTRICAL PERMITS

Section 8. (a) Any person desiring a permit to perform electrical work under this code in or on any building in the city of Portland shall file with the Bureau of Buildings an affidavit setting forth that all work to be done under any permit issued to him during the period of his registration will be performed under the direct supervision or control of a person registered as a Supervising Electrician in accordance with the provisions of Section 9 hereof. Upon the filing of such an affidavit and the payment to the City Treasurer of the sum of twenty-five (\$25.00) dollars as an annual registration fee, the Bureau of Buildings shall issue to the applicant a certificate of registration which shall entitle him to sign applications for electrical permits as hereinafter specified. The name of the applicant and his authorized signature, his place of business, residence and telephone number, if any, shall be filed with the Bureau of Buildings.

REGISTRATION OF SUPERVISING ELECTRICIAN

Section 9. Every person desiring to register as a Supervising Electrician shall file with the Bureau of Buildings an application for registration and an affidavit setting forth that the applicant is not less than twenty-one (21) years of age and has had not less than four (4) years' practical experience in the installation, alteration, repair and maintenance of electrical equipment, wires and apparatus for light, heat or power. In addition the affidavit shall contain the statements of two responsible persons, who have had at least four years' practical experience in the installation, alteration and repair of electrical equipment for light, heat or power, and who are at present actively engaged in electrical installation business, to the effect that they know the applicant has had the four years' experience as required, and that they believe him to be qualified to perform such electrical work as is controlled by this code. Upon approval of the affidavit by the Bureau of Buildings, the applicant shall receive therefrom a certificate or registration empowering him to countersign applications for electrical permits and to perform or direct electrical work authorized by such permits for the current calendar year.

On and after the first day of December, 1917, all persons applying for registration as Supervising Electricians shall submit to an examination as to their qualifications before the Board of Examiners touching their fitness and qualifications on the installation of electric wiring and apparatus for electric light, heat or power, and shall be required to receive an average of seventy (70) per cent on such examinations. Anyone failing to receive the required seventy (70) per cent at any examination shall be prohibited from appearing before the Board of Examiners for re-examination until a period of six months has elapsed subsequent to such failure to pass. The certificate of registration shall automatically expire on the 31st day of December of the year in which the same was issued. The certificate of registra-

tion may be revoked by the Bureau of Buildings if at any time the affidavit filed is shown to be false, or if the person registered as a Supervising Electrician refuse or neglect to comply with any of the provisions of this ordinance. If such certificate of registration has been revoked, no renewal of the certificate shall be allowed for a period of six months thereafter.

This Electrical Code also provides for an Electrical Board of Examiners, consisting of three members appointed by the Mayor. This board must meet quarterly for the purpose of holding examinations, to ascertain the qualifications and fitness of applicants for registration as supervising electricians. The candidate must obtain at least a grade of 70% to pass.

The first regular quarterly meeting and examination of the board was held May 18, 1918. The examination was divided into three parts, as follows:

Problems.—9:00 a.m. to 10 a.m.; twenty points. Examination written, any books or notes allowed to be used in solving the problem.

Questions on the Electrical Code of the city of Portland, Oregon.—Examination written, 1:00 a.m. to 12:00 m. Forty points. No books or aids allowed to be used.

Practical Work.—Actually carried out with tools and materials, at the Benson Polytechnical School, 1:30 p.m. to 5:00 p.m. Forty points.

Three applicants tried this test but none attained a grade of 70%.

The examining board is as follows: W. H. Pickering, E. W. Pierce, Chairman, F. D. Weber, Secretary.

PROBLEMS

(1) What size of rubber covered wire must be used for a three-wire main 110-220 volts, single phase or Edison D.C. system, to conform to the requirements of the Electrical Code of the City of Portland with an allowable drop of 3 volts and the distance to the load center is 40 feet? The circuit is loaded with two groups of 60 amperes of 110 volt lamps, each group connected between the neutral and the outside wires and balanced against each other. Also one group of 220 volt motors taking 20 amperes connected across the outside wires. No overload values to be considered for either lamps or motors.

(2)—

(a) What size of rubber covered wire in conduit should be used to conform to the requirements of Electrical Code of the City of Portland, with an allowable drop to the farthest lamp of 1 volt. Load consists of 12 incandescent lamps each taking $\frac{1}{2}$ ampere. Distance from starting point of circuit to load center is 45 feet. Direct current 2-wire or single phase 2-wire system of distribution being used.

(b) Same problem except distance is 200 feet.

(c) Same problem except load is changed to 200 incandescent lamps and 5 volts drop.

QUESTIONS—ELECTRICAL CODE—CITY OF PORTLAND, OREGON

(1) Draw the symbols which have been adopted to indicate the following electrical equipments:

- (a) Ceiling outlets.
- (b) Bracket outlets.
- (c) Wall receptacle outlets.
- (d) Floor outlets.
- (e) Drop cord outlets.

(2)—

(a) What size of wire B. & S. gage rubber covered must be furnished to supply 12 3-wire branch circuits 660

watts, capacity each, 110 volts.

(b) Same for 6 2-wire branch circuits.

(3) Describe in detail method of making a splice in rubber covered wire.

(4) What material only, is allowed for switchboard construction.

(5) What material only, is allowed for cabinets where the whole system is approved iron conduit.

(6) Describe in detail the standard methods of mounting a Resistance Device.

(7) Under what conditions and how can a transformer be installed inside a building entirely occupied by wholesale grocery company.

(8) Give the standard separation of wires in "Knob" and "Tube" construction for 110-220 volts.

(a) Between the ceiling and floor of a wooden joisted building.

(b) To what extent is this distance cut down by placing a continuous piece of approved flexible tubing on each wire.

(9) State the Code requirements:

(a) For service wires for all buildings.

(b) For all knife switches and cutouts.

(c) State whether a two or three wire service must be installed for all lighting services of 6 circuits or less, and all heating services of 15 amperes capacity or less.

(d) When determining the size of service mains, each circuit on same, must be considered carrying what percentage of full load.

(10) What is the minimum thickness in U. S. metal gage allowable for an iron cabinet.

PRACTICAL PORTION OF THE EXAMINATION

1. Splices in Conductors:

(a) In solid No. 4 B. & S. gage rubber covered wire.

(b) In stranded No. 4 B. & S. gage rubber covered wire.

2. Bending Rigid Conduit:

(a) Right angle bend in ½-inch conduit.

(b) 4-inch offset in ½-inch conduit 12 inches from end of conduit.

(c) Bend and fit conduit to a surface in the Electrical Laboratories.

3. Cutting Rigid Iron Conduit:

(a) Cut ½-inch conduit off and properly prepare for locking to outlet box.

4. Soldering lugs to strand No. 4 B. & S. gage rubber covered wire.

5. Wire portion of circuit, knob and tube concealed ready for a single set of 3-way switches and on 2 ceiling outlets.

FORM USED FOR INCOME AND EXPENSE STATEMENT

The officers of the Utah Power and Light Company felt that it was very desirable to install a merchandising accounting system for the purpose of determining definitely the actual amount of each item in merchandising costs. The accompanying form is one used for tabulating income and expense. It will repay careful study of the items listed as well as the form of arrangement.

MERCHANDISING ACCOUNTING SYSTEM

BY W. R. PUTNAM

(Only by analysis of the dollar of expense into its component elements of overhead, cost of goods sold, installation expenses and similar items can the electrical dealer know where he stands and what leaks should be stopped. The up-to-date practice of the merchandising department of the Utah Power & Light Company is explained below by the efficient salesmanager of that company in a discussion contributed to the Commercial Committee of the Pacific Coast Section, N. E. L. A., in connection with the paper on Retail Selling Practice presented at the recent convention.—The Editor.)

Effective March 1st, 1918, the Utah Power & Light Company installed a merchandise accounting system closely following the recommendation of the Accounting Committee of the N. E. L. A. on this subject, made at the 1917 convention of the National Electric Light Association.

The merchandise business of the Utah Power & Light Company has grown from \$10,000 in 1912 to a total of \$478,000 in 1917.

The combined costs for the months of March and April are as follows:—

ANALYSIS OF COSTS PER EVERY DOLLAR RECEIVED	
Cost of goods sold.....	72.66c
Cost of installation.....	2.93c
Mdse. Salesmen's salaries, etc.....	3.92c
Rental of stores.....	1.26c

General Expense	
Apport. Amount Exp.....	1.50c
General Sales Dept. Exp.....	.95c
Advertising and Demonstration.....	2.69c
Miscellaneous Exp.....	1.59c
Insurance and Taxes.....	.95c
Uncollectable Accounts.....	.25c

Fixed Charges	
Interest on investment.....	2.89c
Interest on working capital.....	.78c
Depreciation and interest on fixtures.....	.01c
Net income.....	7.62c

Note.—The costs are given in cents, the sum total of the costs plus the net income equalling \$1.00 of revenue received from merchandising sales.

The total sales for the two months amounted to \$84,467.72.

INCOME AND EXPENSE STATEMENT MERCHANDISE DEPARTMENT

Division	Date ending 1918				
	FOR	MONTH	CUMULATIVE TO DATE		
	This year	Last year	%	This year	Last year
Revenue from Merchandise Sales					
Cost of merchandise					
Cost of merchandise					
Store room salaries & expenses					
Defective merchandise replaced					
Total Cost of goods sold					
Cost of installation					
Total cost of goods, & installation					
Gross Profit					
Selling Expense					
Merchandise salesmen's salaries & Com.					
Rental of stores					
Total selling expense					
Net Profit					
General Expense;					
App.Div. accounting expense					
App. general sales dept. expense.					
(\$ per month)					
Advertising & Demonstrations					
Miscellaneous expenses					
Ins. & Taxes (1/60th of total stock)					
Uncollectible accts. (1/5 of 1% of total sales)					
Total general expense					
Net Earnings					
Fixed charges;					
Interest on investment (1/60th per month based on \$ invest)					
Interest on working capital (1/60th per month based on \$ def. acct.					
Depreciation & Interest (10%) on store fixt. used for merchandising					
Total fixed charges					
Net Income or Loss					
Percent Net Income					
REMARKS:					

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(There are difficulties involved in foreigners obtaining patents in this country, as well as in Americans gaining protection for enterprises carried on abroad. The process is a more or less simple one where there are well established channels—but in China, for instance, there are no patent laws and consequently no patent attorneys. A most interesting and comprehensive discussion of this subject is here presented by the members of a prominent firm of patent attorneys of San Francisco.—The Editor.)

OBTAINING FOREIGN PATENTS

Persons residing in foreign countries, and particularly those residing in China, are greatly handicapped in applying for and obtaining patents in the United States. The Rules of Practice of the United States Patent Office require that the application be signed and sworn to by the inventor and provide that no change shall be made in the application after it is signed and before it is filed. These rules present no difficulty to persons residing in the United States, because many competent patent attorneys are available who can properly and completely describe and claim the invention and present the application in the form required by the Patent Office. A patent application is an extremely technical document and a patent claim has been characterized as the most difficult legal document to draw, so that it is apparent that a foreign attorney, struggling with translation and being encumbered by the knowledge of patent procedure in his own country, which is materially different from that in the United States, can not ordinarily prepare an application which will be acceptable to the United States Patent Office.

All foreign patent attorneys have correspondents or associate attorneys in this country, to whom they forward their applications for filing and prosecution, but since the application must not be altered after it is signed, the associate attorney files it as he receives it, even though it contains many apparent irregularities. Many of these may be subsequently corrected by amendment, but it often occurs, that some vital point has been omitted and no new matter may be inserted in an application after it has been filed. Fortunately, however, the Examiners in the United States Patent Office appreciate the difficulties of the foreign inventor in filing an application in this country and offer every assistance possible to the resident attorney, to permit him to correct the irregularities in the application.

Residents of China, however, are not as fortunate in this regard as residents of other countries, because China has no patent laws and consequently no patent attorneys to assist in preparing the application. The result of this has been that in the last six years, only sixteen patents have been issued in this country to residents of China. The resident of China, therefore, must either prepare his own application, a very hazardous proceeding at best, or he must submit his invention to an attorney in some other country to have the application prepared. The great length of time required for mail to travel back and forth between this country and China would probably deter the inventor from employing a patent

attorney in this country to prepare his application, but nevertheless we believe that it would be the wiser action for him to take, taking full consideration of the delay in filing the application, due to the fact that after being prepared in this country, the application must be sent to China for signature and execution by the inventor and must then be returned to this country for filing. When the invention apparently possesses great value, it is of greater importance that the application be properly prepared than that it be filed quickly in the patent office.

The selection of an attorney in this country presents difficulty, since unfortunately many patent attorneys are not competent, or worse still, are unscrupulous. In a paper read before the Examining Board of the United States Patent Office, Mr. F. W. H. Clay, Assistant Commissioner of Patents, made the following statements:

"As a class inventors are among the most gullible of men. An inventive genius is quite generally an enthusiast, and it is the disposition of an enthusiast to believe all things. Inventors are not found exclusively among those actually employed in the great manufacturing industries, nor in the great centers of population, where men are surrounded by keen witted lawyers and business men. Many of them are in far outlying country places and in obscure positions where they have no opportunity to obtain reliable legal advisers. These men see in the papers plausibly worded advertisements of patent attorneys and obtain from them laudatory circulars, apparently showing that the attorneys are highly recommended, and they forthwith trust their money and welfare to men they have never seen. Just because they are a peculiarly easy prey to the unscrupulous attorney a patent attorney ought to be, even more than a general practitioner, a man of integrity and fair dealing.

The present evils are glaringly apparent. Make-believe inventions used for promoting stock selling schemes are usually carried on by the aid of unscrupulous patent attorneys. These should be vigorously searched out and eliminated. Great numbers of incompetents who have prostituted a profession into a mere business of fleecing the innocent, swarm about the Patent Office offering alluring prospects to useless ingenuity. When they catch the innocent they file imperfect papers; they prosecute with the sole view of getting a patent quickly without regard to its value; they habitually induce inventors to file expensive foreign applications before investigation as to whether there is an investigation present.

They encourage efforts in wrong directions, promote the patenting of immature ideas, waste the money and energy of inventors, all for the sole purpose of swelling their own profits."

Unfortunately there is no way for the inventor in a foreign country to separate the wheat from the chaff and he is compelled to take chances and trust that the attorney of his selection possesses ability and integrity.

Applicants for patents in countries foreign to the United States are not faced by the difficulties encountered in filing applications in this country. In the majority of foreign countries, the signature of the inventor is required only on a power of attorney, so that the foreign attorney is at liberty to change the form of the specification and claims, as much as he believes to be desirable. The forms of specifications and particularly of claims, vary to a great extent in the different foreign countries, and claims which are acceptable in form in one country are objectionable in others. The resident foreign attorney being familiar with the practice in his own country and being at liberty to alter the specification and claims as much as he desires, will rewrite these parts of the application so that they are acceptable to the Patent Office in his country. It is customary for the United States attorney to forward to the foreign attorney, a copy of the application as filed in this country and permit the foreign attorney to use his own judgment in selecting the important features of the invention and revising the application accordingly. While this is the line of least resistance for the United States attorney to follow, we believe that it is not the proper course to pursue, because it is frequently very difficult to pick out the actual invention from claims as drawn in this country. An attorney here, is or should be, familiar to some extent with the form of claims used in the various foreign countries, and in order to serve the best interests of his client, he should draw the claims in the foreign form to the best of his ability. These claims may not be in exactly the proper form, but they will greatly assist the foreign attorney in analyzing the invention, with the result that he will be able to prepare a proper application. It is also advisable to instruct the foreign attorney as to the main features of the invention so that he will have a clear understanding of the scope of the invention before proceeding to redraft the claims.

We have stated heretofore, that no patent law exists in China and this operates greatly to the disadvantage of China and is one of the causes which has prevented her from becoming a manufacturing country. China offers an extremely rich field for the exploitation of new devices and inventions, but due to the fact that protection for inventions cannot be had, there is no inducement for manufacturers to enter that field. We know of many instances where inventors were extremely anxious to patent their ideas in China and were prepared to follow up their patents with exploitation and manufacture, but the inability to obtain patent protection has dissuaded them from entering that market.

Protection to a limited degree may be had in China against the appropriation of an invention by Chinese, but there is no manner in which protection against foreign residents may be had. This limited protection may be had by filing, at the office of the Consul-General of the United States, at Shanghai, an application for registration of a specification and drawings covering that invention. This consular registration often leads to more than the ordinary extra-territorial confusion. In practically every case, a foreign infringer demands that the question be adjudicated under the laws and by the courts of his own country, which proceeding can not offer much relief to the United States patentee. When the owner of the patent and the infringer are of the same nationality there is no such difficulty, and when the infringer is a Chinese it is possible for the patentee to obtain protection of his rights.

While we are on this subject of foreign patents, we believe it advisable to mention some of the regulations which have been put into effect in this country with relation to foreign patent rights during the war, particularly with relation to enemy countries. Subsequent to the declaration of war by the United States, Congress passed the Trading with the Enemy Act, by which citizens of the United States were permitted to file applications for patents in enemy countries, to prosecute applications pending and to pay the taxes on patents owned by them in enemy countries. It was necessary to obtain a license from the Federal Trade Commission to forward each document or credit and a great mass of matter was sent to enemy countries in that manner.

As long as we continued to do business in that manner with enemy countries, it was an admission on our part and evidence to the enemy that as soon as the war was over, we would begin trading again with them as usual. However, as this country went deeper into the war and realized the utter ruthlessness of the enemy, it was decided to absolutely cut off all relations whatsoever; to prevent the payment of taxes on patents so that the patents would lapse, and to prevent the filing of applications. It means that this country is becoming more serious, that we appreciate the force of the economic boycott and that we are preparing to prevent the re-establishment of commercial relations with the enemy. He has shown himself to be an outlaw and he shall be outlawed forever. On April 11, 1918, the President issued a proclamation revoking the power to issue licenses to citizens to file or prosecute any patent, trade-mark or copyright application in an enemy country, or to pay any tax on any patent, trade-mark, print, label or copyright, so that now all patents in the enemy country which are owned by United States citizens will become lapsed, unless the enemy, in his anxiety to have commercial relations re-established after the war, will take some action to prevent these patents from becoming invalid.

SPARKS—Current Facts, Figures and Fancy

(Most persons familiar with our own deserts in looking at the vast area of China as it is spread out on the map, picture part of it as arid land and sparsely inhabited. The astonishing figures given here as to crowded land holdings point an opposite conclusion. Several new inventions and foreign practices are further featured in the following.—The Editor.)

Spain has joined the other nations in daylight saving and since the middle of April has been starting her day an hour earlier.

* * *

A report of volcanic sulphur falling in Portland recalls a similar mystery of several years ago which proved to be a shower of very heavy pollen which was carried miles by a strong wind.

* * *

Before the summer is over this new game of driving rivets in a ship promises to be as interesting and as carefully scored as baseball. A recent report gives the record to a Portland shipyard, but before the week is out even that record bids fair to be outdone.

* * *

A red danger signal is proposed for automobile searchlights. When making roadside repairs, leaving a garage or the like, a red cylinder is advanced by the pressure of a button to encircle the lamp and thus the parabolic rays are intercepted and turned from white to red.

* * *

Gas masks have joined the periscope in service "over here." Employees of a telephone company in Indiana are wearing them while working on an underground cable. Recently, while work was being carried on at that point, the men did not use masks and one of them was overcome. Since the gas masks have been put in use no further trouble has been experienced.

* * *

An enterprising telegraph company has published a booklet with 250 messages suitable for different occasions. For Christmas you can have a choice of 32 greetings; for Easter there is an assortment of 29, while for weddings the choice is limited to 21, but then one ought to be able to get along with that number. Christmas and Easter occur all at once, but your friends don't all get married on the same day.

* * *

Norway possesses an enormous amount of power in its waterfalls, which have so far been utilized only to a comparatively small extent for power and lighting purposes. After investigation, it has been found that there will be available 15,000,000 horsepower when the different water powers are developed, and it is the intention to centralize this power so that it may be transmitted to all parts of the country. The work will be commenced as soon as possible.

* * *

An electric iron equipped with a switch which opens automatically when the iron is not in use is the latest. A switch button is provided in the forward part of the handle, just where the thumb ordinarily

rests. Under normal ironing conditions, the thumb presses against the switch button and keeps the iron in circuit; removing the thumb cuts it out of circuit. By means of this switch button the current may be cut in and cut out at will be the operator, merely by moving the thumb.

* * *

In Kwangtung one-sixth of an acre will support one person, and the proprietor of two acres of good land having a family of five, can live without work on the produce of his little property. The system of intense farming in China can better be understood by the comparative rule. If the arable land of the State of New York be considered at a comparative rate of production and consumption, as in China, it would support the present population of the United States.

* * *

Evaporation from the surface of Gatun Lake during March, 1918, was the highest that has been recorded since the filling of the lake. It was 8.475 inches, over an area of 165 square miles. The aggregate evaporated water amounted to 3,248,000,000 cu. ft. This is equivalent to 1,213 cubic feet for every second, day and night, in the month. Had the water which the sun drew off been available for power it could have produced as much electricity as the hydro-electric station, the net output for which in March was 4,681,000 kwh.

* * *

In the Annales des Postes, Telegraphes et Telephones, an account is given of an interesting form of telephone receiver which consists of a vessel furnished at its base with a membrane facing an electro-magnet, as in an ordinary receiver. But above this membrane is placed a hollow cone, the base of which contains a second membrane, parallel to and a few millimeters away from the first. The cone contains a second electro-magnet in series with the first one, both being traversed by the speaking current. As a result the hearing value is stated to be doubled as well as the crackling effects and resonance suppressed.

* * *

In order to prevent undue heating of lightning arresters at Gamboa, Panama Canal, connected to the 44,000 volt transmission line, the Electrical Division has covered the metal cases with two layers of quarter-inch asbestos and two layers of heavy muslin. The muslin is made watertight by coating with paint, and a light gray color is used. It has been found that the interior temperature at the middle of the day has been kept down by this arrangement and that it affords effective protection against the heat of the sun, thus making it unnecessary to erect over the tanks the shelters which are generally placed over such arresters in warm climates.

PERSONALS

John A. Britton, vice-president and general manager of the Pacific Gas and Electric Company, has during the last



monthly period contributed service to the West in full keeping with the best traditions of his splendid activity of many years standing. Not only in private life has this service shown itself in his recent going to Tacoma, there to bid his youngest son, First Lieutenant Emmet Britton, a godspeed to France, but as chairman of the San Francisco Chapter of the American Red Cross, he has rendered distinguished

service to the nation in the splendid results attained in the recent Red Cross drive in San Francisco, in which all branches of the electrical industry backed him to the limit. And finally his splendid exhibition of comradeship and evident desire to be of every possible assistance in forwarding the California Electrical Co-operative Campaign, as brought out while toastmaster at the get-together dinner in San Francisco on Friday, June 7, 1918, in the presence of over four hundred men prominent in the industry from all sections of California, have endeared him in the hearts of his fellow workers in a manner beyond the expression of words.

Harry Holabird, of the Holabird Electric Company of Los Angeles, is making an eastern trip in the interest of his company.

Thomas F. Murphine has been appointed president of public utilities of the city of Seattle, Wash., to succeed A. L. Valentine.

J. L. Newell has been appointed electrical superintendent of the British Columbia Electric Railway Company, of Vancouver, B. C., to succeed W. H. Fraser, resigned.

W. H. Evans has been appointed electrical engineer of the Tidewater Southern Railway, with offices at Stockton, California.

R. C. Bridge, manager of the Pacific District for the Willard Storage Battery Company, was a recent visitor in San Francisco.

A. W. Leonard, president of the Puget Sound Traction Light & Power Company, Seattle, is making a business trip to the Stone & Webster offices in Boston.

B. Badrian has resigned from the Hurley Machine Company and enlisted in the U. S. Navy. He is now stationed at San Pedro and working hard to fit himself for an ensign's commission.

W. A. Hillebrand, formerly with the Pacific Gas and Electric Company, San Francisco district, is now on the engineering staff of the Federal Telegraph Company located at Palo Alto.

John B. Fiske, electrical engineer for The Washington Water Power Company at Spokane, appears on the newly elected Board of Directors of the American Institute of Electrical Engineers.

Capt. W. D. Peaslee, U. S. Engineer Reserve Corps, who has been stationed at Camp Lewis since giving up his consulting engineering work at Portland, Ore., is now on his way to France.

Edward A. Lynch, formerly with the Abbott Printing Company of San Francisco, succeeds Mr. Badrian as factory representative of the Hurley Machine Company in the San Francisco district.

Ed. F. Neal, for several years chief electrical inspector for the city of Seattle, has resigned his position and become assistant manager of the Standard Electric Company, 73 Horton street, Seattle.

A. E. Wishon, assistant manager of the San Joaquin Light and Power Company, attended the Get-Together Dinner of the California Electrical Co-operative Campaign held recently in San Francisco.

Hal Lauritzen, illumination specialist of the Pacific States Electric Company, San Francisco, visited the Portland and Seattle offices of the company recently, while paying a visit to the northwest district.

Forest Winfree, formerly auditor of the Richmond (Cal.) division of the Western States Gas & Electric Company, has been promoted to First Sergeant in the San Francisco Base Hospital Unit No. 47.

Paul V. Quick, western representative of Landers, Frary & Clark with headquarters in San Francisco, has returned from a two months' trip through the northwest where he reports the greatest season's business in the history of his company.

Arthur H. Halloran, assistant business manager of the Journal of Electricity, is at Atlantic City where he is attending the annual convention of the National Electric Light Association in the interests of the Pacific Coast Section, N. E. L. A., of which he is secretary.

Gilbert Duffy, formerly office manager in the engineering department of the Puget Sound Traction Light & Power Company of Seattle, Wash., has been appointed secretary to the manager, succeeding Mr. J. M. Wilmott, who has been appointed sales manager for the coal mines.

J. A. Vandegrift, western sales manager for the National Lamp Works, has left for a four weeks' visit to Eastern points where he will attend the annual session of the National Electric Lamp Association held at the now justly celebrated "Association Island" on the St. Lawrence river.

Daniel Gallick, formerly with the publishing staff of the Journal of Electricity, was one of those in the 319th Engineers on Sunday, June 9, who had the pleasure of helping to carry away the marching and singing honors of the day at the vast review in which Madam Schumann-Heink took part.

John Murphy, electrical engineer, Department of Railways and Canals of Canada, has been appointed the duly authorized agent of the Fuel Controller for Canada to promote the substitution of hydro-electric power for steam power, having in mind the conservation of coal. Mr. Murphy has served a long apprenticeship in the telephone, and the electric light, power and railway field, which experience is proving of great value to the various federal controllers, commissions and departments with which he is now associated.

S. M. Kennedy, general agent of the Southern California Edison Company, journeyed all the way from Los Angeles

to attend the get-together dinner at San Francisco on June 7, 1918. Mr. Kennedy has long been recognized as a national figure in central station commercial practice and his sincere relating of the good that has already been accomplished in Southern California combined with his evident conviction of the future success of the California Electrical Co-operative Campaign, caused his listeners to give weighty consid-



eration to the message of helpfulness he brought from the South.

E. R. Davis, general superintendent of the northern division of the Southern California Edison Company, has been elected first vice-president of the Pacific Coast Section N. E. L. A. For years Mr. Davis' effective work with the Pacific Light & Power Corporation before its merging with the Southern California Edison Co. placed his activity among the leaders of the Southwest. His new responsibility marks him as the sole representative of the Southern California Edison Company upon the new managerial board of the Pacific Coast Section N. E. L. A. The



splendid utility ideals of the company he represents have called forth favorable comment in the technical press the country over. Much is expected of Mr. Davis during the coming year and it is confidently believed he will make good in helping to solve the weighty problems now before the electrical industry in the West.

Romaine W. Myers, consulting electrical and illuminating engineer, with headquarters at Oakland, California, has been appointed on the divisional committee on lighting of the National Council of Defense. Adequate and satisfactory lighting in all plants doing government contract work is within the province of this committee.

C. S. MacCalla has resigned as vice-president and general manager of the Washington Water Power Company, of Spokane, Wash. He had been with the company for 16 years, previous to which time he was with an Australian railway for the General Electric Company and later with the Brooklyn Edison Company, of New York.

William T. Price has been appointed traffic manager of the Denver Tramway Company and the Denver & Intermountain Railroad Company, of Denver, Colo. Up to now he has been commercial agent for the Union Pacific system in charge of southern Colorado, which he handled from Pueblo.

John B. Miller, chairman of the Pacific division of the Red Cross, was guest of honor at a luncheon given him at the Bohemian Club by the managers of the San Francisco division. Mr. Miller devoted much of his time during the drive to San Francisco and materially helped that city go over the top.

Captain W. J. Conway, of Vancouver, B. C., has been appointed secretary of the British Columbia Association of Electrical Contractors and Dealers to fill the position formerly occupied by R. B. W. Pirie. Captain Conway is considered one of the liveliest wires in British Columbia and it is expected the association will forge ahead under his able leadership.

R. T. Stafford, manager in the northwest for Allis-Chalmers Manufacturing Company with headquarters at Seattle, returned recently from a trip to California. While away he attended the Pacific Coast Electrical Jobbers convention and convention of the National Electric Light Association held at Del Monte, California, May 8th to 11th inclusive.

C. A. Lee, of the engineering department of the British Columbia Electric Railway Company, of Vancouver, B. C., recently resigned to enter the U. S. Navy as lieutenant in the civil engineers corps. Mr. Lee entered the employ of the company in 1909, and was in charge of the hydro-electric developments at Lake Coquitlam in 1911 and at Jordan River from 1912 to 1915.

F. W. Gay, general manager of the Atlantic department of the Pelton Water Wheel Company with headquarters in New York City, is greeting again many of his former engi-

neering associates in San Francisco, where he is a recent visitor. It will be recalled that Mr. Gay was for some years the able representative of J. G. White & Company in this section.

Jerome W. Landfield, of San Francisco and a noted lecturer on Siberian and Russian matters and widely known in engineering and commercial matters on the Pacific Coast in their relation to the Orient, has gone to Washington, D. C., prior to his departure to Siberia where he goes on a special mission for the United States government.

Dwight W. Jones, youngest son of E. C. Jones, chief gas engineer for the Pacific Gas and Electric Company, has received his commission as second lieutenant in the Field Artillery and is assigned to Company C of the 115th Ammunition Train, situated at Camp Kearny, California. Mr. Jones entered the Third Officers' Training School and graduated near the head of his class.

C. N. Cross, assistant professor of mechanical engineering at Stanford University, has assumed the duties of efficiency engineer for the Federal Fuel Administration in California. A detailed study will be made of the power plants of the state, especially the smaller units, and suggestions will be made as to how power plant economy can be bettered and thus a saving of fuel oil realized.

Lars Jorgensen, consulting engineer, J. C. Clark, assistant professor of electrical engineering, Stanford University, Clarence E. Rogers of the Pacific Telephone & Telegraph Company, L. S. Ready of the California Railroad Commission and Robert Sibley, editor Journal of Electricity, constitute the newly elected executive committee of the San Francisco Section of the American Institute of Electrical Engineers.

Thomas A. O'Donnell, director of oil production, U. S. Fuel Administration, was the guest of honor and principal speaker at a recent fuel administration dinner given by the Chamber of Mines and Oil at the Sierra Madre Club. Before a representative and enthusiastic gathering of over 250 oil men, Mr. O'Donnell talked at length on the "Petroleum Situation and Our National Needs."

Frederick Haynes Newell, formerly director of the Reclamation Service, now head of the department of civil engineering in the University of Illinois, is the recipient of the Cullom Geographical medal awarded by the American Geographical Society of New York. This gold medal has been awarded from time to time to explorers, writers, and men of science who have contributed to the advancement of geographical knowledge.



IN MEMORIAM



Lieutenant Thomas A. Davidson, a well-known engineer of the Pacific Coast States and a former contributor to the columns of the Journal of Electricity on the water supply of Victoria, B. C., has died of his wounds in France. The following letter has been received at the University of California, written by his brother:

"Gentlemen:

"My brother, Second Lieutenant Thomas A. Davidson of the Royal Garrison Artillery, once expressed a wish to me that in the event of his death, word should be sent to your periodical. He obtained his bachelor's and master's degrees from the University of California and rowed in the crew for four years, being captain in the fourth year. He joined the Canadian forces in the spring of 1915, coming overseas in the Canadian Overseas Railway Construction Corps as a sapper. After service in France, he obtained his commission in the British artillery, being gazetted in March, 1917. He returned to the front in August and died of wounds at No. 54 Casualty Clearing Station on April 9th, 1918.

"Sincerely yours,

"LIEUT. G. C. DAVIDSON '08,
"15th Reserve Batt'n, Canadians."

"25 April, 1918."

MEETING NOTICES FOR ELECTRICAL MEN

(Annual meetings and election of officers mark the beginning of the vacation season. Several of the national societies are holding conventions in the June period and local meetings are largely of a special nature—but therefore, also, of special interest.—The Editor.)

THIRTY-FOURTH ANNUAL CONVENTION, A. I. E. E.

The thirty-fourth annual convention of the American Institute of Electrical Engineers will be held June 26-28, at the Marlborough-Blenheim Hotel, Atlantic City, N. J.

The convention will include six technical sessions, an informal reception and dance on the evening of the first day, and conferences of Institute officers and Section and Branch delegates at luncheon each day from 12:30 to 2:30 p.m. There has been no session assigned to Thursday afternoon in order that those present may avail themselves of the many attractions and entertainments which Atlantic City offers.

ANNUAL A. I. E. E. MEETINGS

The final meeting of the season for the Utah Section was held at the University Club, Salt Lake City, on the evening of May 28th. The event was celebrated by a dinner and a short business meeting.

The Spokane Section held its annual meeting on May 17th, with a program consisting of talks by Prof. M. K. Akers on "The Fundamental Mathematics of A.C. Circuits" and by Major P. T. Acland on "Recollections of Ypres Salient."

The annual meeting of the Denver Section was held at the Denver Athletic Club on May 18th. "Wireless Communication and Signaling on Sea and Land" was the subject matter of a paper by R. C. Mann, formerly of the U. S. Navy Submarine Service. Prof. O. C. Lester of the University of Colorado also gave an address on "The Phenomena of Eclipses of the Sun"—with particular reference to the eclipse of June 8th which was viewed in its total phase in Denver.

DRAINAGE CONFERENCE

A drainage field-meeting was held in Portland and vicinity June 4th. This meeting was arranged by the Oregon State Drainage Association in co-operation with the extension service of the college and the Oregon Development Bureau, and is the first annual field meeting of the association.

R. P. Teele, associate chief of drainage and irrigation investigations of the United States department of agriculture, and representative of the capital issues committee, was the principal speaker from outside the state.

PACIFIC COAST GAS ASSOCIATION

The second "Get Together" Dinner of the Pacific Coast Gas Association for the season of 1918 will be held at the Palace Hotel, San Francisco, on Saturday evening, June 15, at 6:30 p.m. Members are accorded the privilege of inviting guests.

SACRAMENTO ENGINEERS' CLUB

At a recent meeting of the Sacramento Engineers' Club, the members enjoyed a program given by Mr. O'Shaugh-

nessy, City Engineer of San Francisco, on the present progress in the Hetch Hetchy work. The talk was beautifully illustrated with lantern slides. The meeting was held in the spacious auditorium of the High School, the business men being invited as guests of the club.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

The B. C. Association of Electrical Contractors and Dealers held their regular monthly meeting at 406 Yorkshire Building, Vancouver, B. C., on the 4th instant.

There was a large attendance, the chair being taken by the president, Mr. C. H. E. Williams.

The business of the meeting consisted of the appointment of a secretary-treasurer, Captain W. J. Conway, 1575—12th Ave. W., B. C.; and the appointment of a special committee to make arrangements for the next (second) annual meeting, which is to be combined with a picnic to be held at Victoria, B. C., about the middle of August, when it is hoped that Mr. Elliot of San Francisco may be present to repeat his kindness of last year, by giving the association the benefit of his advice on matters electrical.

The president read his report on the California Convention and was tendered a vote of thanks for his excellent work and report.

Mr. Hayward was present as a delegate from the Victoria association.

ANNUAL MEETING, PORTLAND N. E. L. A. AND A. I. E. E.

One hundred and two members of the local Section of the A. I. E. E. and N. E. L. A.

journeyed by auto to Mrs. Henderson's at Crown Point on the Columbia River Highway, Tuesday evening, June 4, 1918, where a chicken dinner awaited them.

During the dinner they were entertained by various musical numbers.

The meeting was called to order by Mr. E. D. Searing, president of the local Section A. I. E. E., after which it was turned over to Hon. J. A. Laing, General Counsel for the Pacific Power and Light Company, who presided for the balance of the evening.

The speaker of the evening was Prof. Stafford, head of the chemistry department of the University of Oregon. In an informal talk Prof. Stafford told of his research work in connection with the problem of making use of the waste wood of the northwest.

OFFICERS ELECTED

A. I. E. E.—R. M. Boykin, chairman; W. D. Scott, secretary; F. H. Murphy, A. S. Moody and E. D. Searing, executive committee.
N. E. L. A.—H. H. Schoolfield, chairman, R. F. Monges, vice-chairman; F. H. Murphy, secretary; A. N. Cudworth, treasurer; C. L. Warnicke, C. P. Osborne and C. R. Young, executive committee.

BUILDERS OF THE WEST — XXXI



CAPTAIN ROBERT DOLLAR

From the earliest historic times on down through the ages men who have sailed the seas and manned the ships that ply the commerce of the world have been recognized as builders of the first order. To Captain Robert Dollar, whose ships have become familiar and friendly visitors in all the great seaports of the Pacific, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his great work as a Builder of the West.

CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

(There was held in San Francisco on Friday evening, June 7, 1918, in the commercial club rooms a get-together dinner which proved so representative in its make-up and so sincere in its expression that it may well be termed one of the great gatherings of the year. The affair was held under the auspices of the advisory committee of the California Electrical Co-operative Campaign before an audience of over four hundred.—The Editor.)

In the issue of the Journal of Electricity for April 1, 1918, an account was given at some length concerning a similar gathering in Los Angeles, held on March 15. Since that time results have already been attained in Southern California which indicate that the formulators of this splendid spirit of co-operative helpfulness are working along the right lines.

The effect of such a movement as this will not be local. It will spread beyond the bounds of the nation and as commented upon in the leading editorial of this issue of the Journal of Electricity, this principle of respecting the ethics of the various branches of the industry when the one overlaps the other may well be applied to countless other perplexing world problems and may eventually pass over the seas and become a strong factor in maintaining the perma-

nent peace of the world. For an institution founded upon the principles of right and justice can not be narrowed down to any locality or particular application.

The tables at the banquet were beautifully arranged and lively singing was indulged in throughout the evening. An attractive song book was given to each person in attendance which will long serve to keep alive the good times experienced. The following was the program in detail:

PROGRAM

- JOHN A. BRITTON, Toastmaster—
Vice-President and General Manager Pacific Gas and Electric Company.
- L. H. NEWBERT—
Chairman Advisory Committee, California Electrical Co-operative Campaign; Manager Commercial Department, Pacific Gas and Electric Company.
- H. C. REID—
Pacific Fire Extinguisher Company; President California Association of Electrical Contractors and Dealers.



THE SAN FRANCISCO GET-TOGETHER DINNER OF THE CALIFORNIA ELECTRICAL CO-OPERATIVE CAMPAIGN

Here is a gathering of over four hundred in attendance, composed of men prominent in the electrical industry from many cities of California. The purpose of the assembly is to forward a spirit of mutual helpfulness and judging from the enthusiastic reports from all quarters the meeting may be classed as having proved highly successful in every sense of the word.

SAMUEL KAHN—

Vice-President and General Manager Western States Gas and Electric Company; President Pacific Coast Section of the National Electric Light Association.

FRANK R. DEVLIN—

Member Railroad Commission of the State of California.

A. B. C. DOHRMANN—

President Dohrmann Commercial Company and Nathan-Dohrmann Company.

S. M. KENNEDY—

General Agent Southern California Edison Company.

ALBERT H. ELLIOT—

Secretary Pacific Division Electrical Supply Jobbers' Association; Attorney California Association of Electrical Contractors and Dealers. Songs by Frank Fowden and Lowell Redfield. Community Singing.

The Advisory Committee at their meeting Saturday, June 8th, adopted the following policy with respect to the sale of current consuming devices by central stations and dealers:—

"It is the policy of the Advisory Committee not to ask or urge Central Stations to go out or to stay out of the business of selling lamps, appliances, etc., at retail to their regular consumers. It is, however, the policy to encourage the central stations to conduct their selling of appliances, etc., in a manner which shall conform to the business ethics of the retail merchants in whatever territory the central station conduct a retail merchandise business.

"It is also the policy of the Committee to help and encourage dealers to improve their business methods and so to serve the public in the retailing of lamps and appliances that a large volume of the business will naturally flow to them. This policy will be followed by the committee to the end that these two branches of the electrical industry may both profit to the greatest extent, and that the consumer may enjoy electrical service at the lowest cost consistent with the quality of the service."

The Committee also arranged to issue and distribute a monthly bulletin which would carry to the contractor-dealers and other contributors information about the progress and plans of the campaign.

The Committee accepted an invitation from the Executive Committee of the California Association of Electrical Contractors and Dealers to present the story and plan of the campaign at the evening meeting of the Contractor-Dealers' Association which is to be held in Oakland on July 27th.

A get-together dinner for the central district of California is to be held in Fresno early in August. The plan and work of the campaign will be told at this Fresno meeting as it has been at the Los Angeles and San Francisco meetings with the idea of enlisting all people engaged in the electrical industry to take an interest and a part in the campaign work.

ATTENDANCE AT CO-OPERATIVE CAMPAIGN DINNER

ENGINEERS AND MISCELLANEOUS ATTENDANCE

H. C. Reid, Pres. Cal. Ass'n of Elec. Cont. & Dealers
Albert Elliot, Sec'y Pac. Div. Elec. Supply Jobbers' Ass'n
Geo. E. Kimball, Industrial Accident Comm.
Robt. Stringham, Industrial Accident Comm.
W. M. Deming, General Manager, Journal of Electricity
Robert Sibley, Editor, Journal of Electricity
Rudolph W. Van Norden, Consulting Engineer
Romaine W. Myers, Consult. Elec. Engr.
Arthur H. Barendt
L. N. Robinson, Univ. of Cal.
Lloyd Henly, Railroad Comm.
B. D. Dexter, Railroad Comm.
Nathan A. Bowers, Pacific Coast Editor, Electrical World
Lowell Redfield, Redfield Music Studio, Oakland
George A. Cleary, Board of Fire Underwriters
Walter J. Dodge, Railroad Comm.
F. T. Vanatta, N. W. Pac. RR.
Jewett A. Baker, Sec'y Alameda Co. Fixture Ass'n
R. A. Rodell, The Paraffine Company, Inc.
Rod. G. Guyett, Crocker Bldg.
J. W. Redpath, Sec'y Cal. Ass'n Elec. Cont. & Dealers
W. H. Brainerd, Field Representative Cal. Elec. Co-operative Campaign
N. E. Bittmann, Bittmann Battery
H. N. Nelson, Enterprise Elec. Wks.
J. M. W. Gerkyson, Supt. The Pac. Tel. & Tel. Co.

MANUFACTURERS & JOBBERS

Alexander & Lavenson Electric Supply Co.

David K. Johnson, S. F.
W. E. Andrews, S. F.
Marcel L. Hirsch, S. F.
George H. Ross, S. F.

Baker-Joslyn Company

C. G. A. Baker, S. F.
Harry Hartzell, S. F.

Hamilton & Pacific Company

George H. Sharp, S. F.
Curt C. Davis, S. F.
Bethlehem Shipbuilding Corporation
Henry C. Vollers, S. F.
H. O. Hook, S. F.
California Electrical Supply Company
T. H. McDonnell, S. F.
J. Hepburn, S. F.

Crocker-Wheeler Company

W. K. Brown

Drendell Electric Mfg. Company

A. E. Drendell, S. F.

Dunham, Carrigan & Hayden Company

C. E. Wiggins, S. F.
H. S. Engle, S. F.
Eugene P. Schaefer, S. F.
A. J. Johnson, S. F.

Edison Electric Appliance Company

B. Y. Gibson, S. F.
W. J. Verdery, S. F.

Electric Railway & Mfrs. Supply Company

Harry C. Herning, S. F.
Geo. H. Curtiss, S. F.
Samuel H. Taylor, S. F.
Purcell Rowe, S. F.

Electric Appliance Company

H. D. Havey, S. F.
W. E. Shields, S. F.
J. H. Miller, S. F.
L. V. Carr, S. F.
J. P. Morgan, S. F.
Wm. Weston, S. F.
R. E. Salven, S. F.
Geo. R. Thomson, S. F.
H. F. Schultz, S. F.
H. Zweifel, S. F.
H. A. Cram, S. F.
F. J. Cram, Salesmanager, S. F.

Fairbanks, Morse & Company

V. E. Nittinger
J. W. Ferguson

Garland-Affolter Eng. Company

P. H. Affolter

General Electric Company

E. O. Shreve, Asst. Local Mgr., S. F.
R. M. Alvord, Local Mgr. Supply Dept., S. F.
W. J. Davis, Jr., Pac. Coast Engineer, S. F.
F. E. Boyd, Mgr. Small Motor Dept., S. F.
C. A. Loring, Chief Clerk, S. F.
R. E. Monell, Foreign Dept., Schenectady, N. Y.
F. D. Fagan, Dist. Sales Mgr., Edison Lamp Works
Frank P. Bloomer, Correspondent, S. F.
G. I. Kinney, Foreign Dept., S. F.
C. B. Johnson, Engineering Dept., S. F.
H. C. Stanley, Engineering Dept., S. F.
W. J. Delehanty, Engineering Dept., S. F.
John J. Laingor, Salesman, S. F.
W. E. Camp, Salesman, S. F.
F. O. Sievers, Salesman, S. F.

M. C. Hixson, Salesman, S. F.
J. O. Dillingham, Salesman, S. F.
E. A. Hunt, Salesman, S. F.
R. C. Mixer, Salesman, S. F.
E. W. Garcia, Salesman, S. F.
W. C. Sage, Salesman, S. F.
A. Fulton, Salesman, S. F.
L. V. Hunt, Salesman, S. F.
E. P. Markee, Salesman, S. F.
A. G. Jones, Salesman, S. F.
S. G. Gearhart, Salesman, S. F.
C. F. Forsberg, Salesman, S. F.
R. E. Kenyon, Salesman, S. F.
J. W. Van Huysen, Salesman, S. F.

Gibson Electrical Supply Company, Oakland

Rosse U. Gibson, Oakland
W. E. Arden, S. F.
L. C. Moore, S. F.
A. P. Peck, S. F.
P. S. Benjamin, S. F.
R. F. McDonald, Oakland
P. R. Litton, Oakland

Hunt Mirk & Company, Inc.

K. G. Dunn

Hurley Machine Company

E. A. Lynch

H. W. Johns-Manville Company

J. W. Thompson
J. H. Daveler

K. P. F. Electric Company

A. J. Jahl

Landers, Frary & Clark

Paul V. Quick

Majestic Electric Development Co.

Milton H. Schoenberg
T. D. MacMullen

National Conduit & Cable Company

J. E. Crilly

National Carbon Company, Inc.

J. T. Littlefield
F. G. Beck, Manager
F. P. Gillespie

Pacific States Electric Company

T. E. Bibbins, President, S. F.
S. B. Anderson, Treasurer, S. F.
A. H. Kahn, Chief Clerk, S. F.
Ralph H. Small, Salesman, S. F.
Earle P. Durley, Salesman, S. F.
Thos. H. Nemes, Salesman, S. F.
M. E. Hickox, Salesman, S. F.
Aug. J. Lutz, Salesman, S. F.
H. R. Noack, Salesman, S. F.
Claude M. Johns, Salesman, S. F.
A. A. Elick, Salesman, S. F.
Geo. G. Drew, Salesman, S. F.
Frank Fowden, Salesman, S. F.
L. P. Vanatta, Salesman, S. F.

Panama Lamp & Comm. Co.

Jas. Thieben

Rieber Laboratories

Frank Rieber, S. F.
C. C. Warren, S. F.

Robbins & Myers Company

C. R. Hunt, S. F.
H. S. Jones, S. F.

Sangamo Electric Co. and K. P. F. Electric Co.

Noble A. Wright, S. F.

Schaw-Batcher Company

Noble A. Wright, S. F.

H. B. Squires Company

H. B. Squires, S. F.
E. G. Nelson, S. F.

Steiger & Kerr Store Co.

Chas. D. Steiger, S. F.

Wagner Electric Mfg. Company

A. J. Myers, S. F.
J. P. Perry, S. F.
J. M. Trobert, S. F.
A. F. Wells, S. F.

Western Electric Company

W. S. Berry, Salesmanager, S. F.
M. S. Orrick, Asst. Salesmanager, S. F.

Hocan, Salesman, S. F.

W. C. Martinez, S. F.
E. A. Crowson, Salesman, S. F.
W. Todd, Service Man, S. F.
C. C. Caven, Salesman, S. F.
L. J. Brown, S. F.
W. L. Neelands, Salesman, S. F.
F. I. Du Frane, Salesman, S. F.
C. L. Hynck, Salesman, S. F.

Westinghouse Electric & Mfg. Co.

K. E. Van Kuran, District Mgr., Los Angeles
C. E. Heise, District Mgr., S. F.
J. A. Nadon, Salesman, S. F.
W. P. L'Hommiedien, Mgr. Power Dept., S. F.
H. C. Hopkins, Publicity Reporter, S. F.
W. R. Dunbar, Salesman, S. F.
Waldo C. Cole, Salesman, S. F.
R. T. Behan, Mgr. Supply Dept., S. F.

Woods, Creighton & Morris

J. G. Creighton, Oakland
W. B. Morris, Oakland

Garnett Young & Company

A. E. Rowe
S. B. Hawken
E. C. Kinsey

CENTRAL STATIONS

California-Oregon Power Company

J. C. Thompson, Sec'y and Auditor, S. F.
H. C. Stoddard, Statistician, S. F.
P. O. Crawford, Supt., S. F.
Wm. Shepard, Com'l Mgr., S. F.

Coast Counties Gas & Electric Co.
S. Waldo Coleman, Pres. & Gen'l Mgr., S. F.
G. P. Egleston, New Bus. Mgr., S. F.
E. J. Sherman, Asst. Mgr., Hollister
R. L. Cardiff, Dist. Mgr.

Great Western Power Company
M. Fleishhacker, President, S. F.
J. B. Black, Gen'l Sales Mgr., S. F.
F. H. Woodward, Dist. Mgr., Oakland
Monty C. Pfyl, Salesman, Oakland
A. E. Clark, Salesman, S. F.
B. M. Levy, Dist. Mgr., Santa Rosa
Geo. A. Lindstrom, Salesman, S. F.
Frank W. Smith, Purch. Agt., S. F.

Northern California Power Company
Edward Whaley, Gen. Mgr., S. F.
Harry Corwin, Asst. Purch. Agt., S. F.

Pacific Gas & Electric Company
John A. Britton, Vice-Pres. and Gen'l Mgr.
A. F. Hockenbeamer, Second vice-Pres. & Treasurer, S. F.
L. H. Newbert, Mgr. Com'l Dept.
J. O. Tobey, Supt. Sacramento Dist., Sacramento

K. I. Dazey, Mgr. Collections, S. F.
R. E. Fisher, Asst. Mgr. Com'l Department, S. F.
L. F. Galbraith, Asst. Mgr. Com'l Dept., S. F.

F. Talcott, Asst. Mgr. Com'l Dept., San Francisco District, S. F.
C. W. Horton, Auditing Dept., S. F.
R. W. Dietsch, Rate Dept., S. F.
L. F. Walsh, Mgr's Office, S. F. Dist., S. F.

John H. Hunt, Purch. Agt., S. F.
Geo. I. Williams, Asst. Purch. Agt., S. F.

J. E. Murphy, Purch. Dept., S. F.
L. M. Evans, Mgr's Office, San Francisco Dist., S. F.

J. T. Ryan, Engr. Valuation Dept., S. F.

L. B. Smith, Distribution Dept., S. F.
W. O. Stevens, Distribution Dept., Oakland

M. O. Briggs, Distribution Dept., Oakland

A. P. Parratt, Auditor Oakland Dist., Oakland

E. C. Ray, Mgr. Contra Costa Dist., Martinez

Arthur E. Caldwell, Mgr. Com'l Dept., San Jose Dist., San Jose

J. H. Pape, Asst. Mgr. Alameda County Dist., Berkeley

Wm. A. Widenmann, Mgr. Stanislaus Dist., Newman

J. H. Fagg, Supt. San Joaquin Dist., Stockton

Frederic J. Southerland, Local Agt. Richmond

Jos. Chrysostomo, Jr., Com'l Dept., Oakland

Chas. Jordan, Com'l Dept., Oakland

W. L. Price, Com'l Dept., Oakland

Capt. George Bellew Baldwin, Mgr. Com'l Dept., Sacramento Dist., Sacramento

Henry Bostwick, Mgr. San Francisco Dist., S. F.

H. P. Pitts, Mgr. Com'l Dept., San Francisco Dist., S. F.

George B. Furniss, Asst. Mgr. Alameda County Dist., Oakland

Frank A. Gray, Asst. Mgr. Com'l Dept., S. F. Dist., S. F.

A. Strauch, Range Expert, Com'l Dept., S. F.

P. M. Downing, Chief Engr. Electrical Dept., S. F.

F. R. George, Chief Load Despatcher

Frederick S. Myrtle, Mgr. Publicity Dept., S. F.

S. J. Lisberger, Engr. San Francisco Distribution, S. F.

H. A. Laidlaw, Asst. Engr., S. F.

George H. Bragg, Asst. Engr. Electrical Dept., S. F.

W. R. Symmerhayes, Com'l Dept., S. F.

H. C. Ross, Com'l Dept., S. F.
O. C. Lewis, Com'l Dept., S. F.
Alfred Anderson, Com'l Dept., S. F.
Frank Nyeda, Com'l Dept., S. F.
A. J. Barbieri, Com'l Dept., S. F.
J. E. Van Hoosear, Industrial Engr. Com'l Dept., S. F.

R. A. Smith, Com'l Dept., S. F.
D. H. Rountree, Com'l Dept., S. F.
A. G. Hanton, Com'l Dept., S. F.
Cress Unger, Com'l Dept., S. F.
H. M. Crawford, Com'l Dept., S. F.
Wm. H. Augustine, Com'l Dept., S. F.

W. H. McLaughlin, Com'l Dept., S. F.

Spencer Moore, Com'l Dept., S. F.

R. W. Belson, Com'l Dept., S. F.

San Joaquin Light & Power Co.
A. Emory Wishon, Asst. Gen. Mgr., Fresno

Sierra & San Francisco Power Co.
W. L. McKinley, Right of Way Agt.

Eunice M. McKinley, S. F.

H. F. Jackson, President & Gen'l Mgr., S. F.

J. E. Woodbridge, Consulting Engr.

C. J. Rhodin, Valuation Engr.

James F. Pollard, Com'l Mgr.

R. Reid, Asst. to Val. Engr.

E. A. Richards, Chief Clerk

L. C. Helfrich, Purch. Agt., S. F.

P. F. Kelley, Salinas Gen'l Agt., Salinas

Southern California Edison Company
S. M. Kennedy, Gen'l Agt. So. Cal. Edison Co., Los Angeles

Vallejo Electric Light & Power Co.
Albert Casper, Vallejo

Universal Electric & Gas Company
E. Sproul, Supt., S. F.

R. R. Dunnigan
H. E. Grant

A. L. Stauffer, Contract Dept., S. F.

W. F. Neiman, Mgr. Com'l Dept.

Western States Gas & Electric Co.
Sam. H. Kahn, Vice-Pres. and Gen'l Mgr., Stockton

C. M. Brewer, Dist. Mgr., Richmond

CONTRACTOR-DEALERS

Cohen's Sons, L. S.

W. C. Cohen, S. F.

Decker Elec. Construction Co.

P. Decker, S. F.

J. F. Richmond, S. F.

Thomas Day Company

Walter W. Hooker

James T. Gates, S. F.

Electric Hardware Company

W. V. Riley, S. F.

Delta Electrical Company

John A. Hunt, Antioch

Electric Supply Repair Company

Al Rosenberg, S. F.

Stockton Elec. Contractors' Ass'n

R. Gnekow, Secretary, Stockton

East Bay Elec. Trade Ass'n

N. P. Ellis, Oakland

Electric Manufacturing Co.

H. G. Levy, S. F.

E. T. Cunningham, S. F.

Electric Engineering & Supply Co.

A. T. Flanagan, Stockton

Electrical Construction Co.

J. Gensler, Oakland

The Electric Shop

R. D. Smith, Sacramento

F. J. Wallace, Sacramento

Enterprise Electric Works

Geo. E. Roe, S. F.

Farnsworth Electric Works

H. T. Adams, S. F.

San Mateo

J. A. Foster

Garden City Electrical Co.

H. C. Doerr, San Jose

Electric Works

S. Gelber, S. F.

Stockton

Gould, The Light Man

Gilroy Appliance Co.

E. D. Hollenbeck, Gilroy

Greenep Electric Works

E. W. Greenep, Hollister

Gas & Electric Sales Co.

E. R. Week, Jr., S. F.

The Home Electric Co.

Berg. Varnatt, Stockton

Hyatt Electric Works

W. P. Hyatt, Sacramento

J. C. Hobrecht Co.

Wm. H. Beamer, Sacramento

Hanbridge Electric Shop

W. S. Hanbridge, S. F.

Home Electrical

M. L. Scobey, S. F.

Holtermann's Electric Shop

R. L. Marshall, S. F.

San Francisco

Sam. C. Hamilton

Improved Electric Co.

A. H. Cheney, S. F.

Incandescent Supply Co.

Austin Liebes, S. F.

Jackson Furniture Co.

W. E. Jackson, Oakland

Koven Electric Co.

J. L. Koven, S. F.

King's Electric Co.

Robert King, Oakland

Kohlwey, Alfs, Smith

E. W. Regehsburger, S. F.

Geo. D. T. Smith, S. F.

W. D. Kohlwey, S. F.

Carl J. Alfs, S. F.

San Francisco

W. H. Kirsten

Kimball Electric Co.

E. A. Chloupek, Oakland

Hugh Kimball, Oakland

Levy Electric Co.

Sam Fingerhut, S. F.

Louis Levy, S. F.

Phil Levy, S. F.

M. C. Baker & Son

W. A. Baker, S. F.

Byington Electric Co.

Robert Byington, S. F.

H. E. Schuck, S. F.

Buzzell Electric Works

F. N. Buzzell, S. F.

Miss H. Knutsen, S. F.

R. A. Graham, S. F.

John Petersen, S. F.

H. B. Kinney, S. F.

Century Electric Co.

Frank P. Somers, San Jose

Capital Electric Co.

R. V. Oyler, Berkeley

W. T. Dunn, Berkeley

R. H. Conrad Electric Co.

R. H. Conrad, Oakland

Central Electric Co.

John Stanovich, Watsonville

J. A. Schanbacher, Watsonville

Collonon Electrical & Mfg. Co.

C. F. Collonon, S. F.

Commercial Electric Co.

C. J. Franke, S. F.

Cox Electric Co.

Walter Cox, S. F.

California Mech. & Elec. Eng'r Co.

Jas. A. Woods, Sacramento

J. P. Cedarhohn, Sacramento

E. M. Coffin, Oakland

Levy Electric Co.

B. P. Jones, S. F.

M. C. Martini Electric Co.

M. C. Martini, S. F.

Maxwell Hardware Co.

Robert F. Norling, Oakland

Leo Greenwood, Oakland

F. E. Newbury Electric Co.

C. J. Newbury, S. F.

G. E. Arbogast, Los Angeles

Novelty Electric Sign Co.

Milton Birnbaum, S. F.

J. Hotchner, S. F.

NePage-McKenny Co.

A. R. Kolls, Oakland

National Electric Co.

A. L. Hughes, S. F.

Pacific Electric Motor Co.

W. L. Mitick, Oakland

Palace Hotel Co.

Edwin A. Rogers, S. F.

Pioneer Electric Co.

Charles H. Remick, Richmond

Piedmont Electric Co.

W. E. Calmbach, Oakland

F. E. Fariss, Oakland

Al. J. Connolly, Oakland

Roberts Manufacturing Co.

F. H. Thrall, S. F.

Rex Electric Co.

Tom Bennett, S. F.

Richmond Electric Co.

S. B. Hammond, Richmond

Richmond Repair Co.

T. F. Nelson, S. F.

San Francisco

Geo. A. Sittman

C. A. Bowman

G. S. Wentworth

Standard Electrical Construction Co.

Carl F. Wolf, S. F.

S. Szank, S. F.

A. Schnuter & Co.

C. C. Wand, Oakland

Solano Supply & Construction Co.

T. O. Dowdell, Suisun

Seaboard Electric Co.

W. Weisheimer, S. F.

S. Marcuse, S. F.

Sterling Electric Co.

W. A. Weigh, Sacramento

Turner Company

H. W. Baynton, S. F.

Valley Electrical Supply Co.

H. H. Courtright, Fresno

Weidenthal-Gosliner Elec. Wks.

F. W. Schultz, S. F.

A. F. Wells Co.

C. M. MacDonald, S. F.

L. J. Douat, S. F.

B. C. White Co.

B. C. White, Berkeley

Watts Electric Co.

Frank N. Watts, S. F.

N. M. Hope, S. F.

Waxon Brothers

F. Waxon, Sacramento

Advance Electric Co.

R. C. Hester, Oakland

G. L. Priest, Oakland

Miss Beatrice White, Oakland

Brumfield Electric Sign Co.

E. H. Brumfield, S. F.

Butte Engineering & Electric Co.

C. F. Butte, S. F.

Berkeley Electrical Co.

J. R. Fort, Berkeley

A. A. Smith, Berkeley

HAPPENINGS IN THE INDUSTRY

Personal Items

M. C. Turpin, formerly assistant to the manager, Westinghouse Department of Publicity, has resigned to enter federal service as assistant to the manager, Technical Publicity Bureau, Ordnance Department. Mr. Turpin's work will be on the dissemination of information from the War Department to manufacturers, through the medium of the trade press.

A. MacLachlan, of the Square D Company with headquarters at Detroit, Mich., is making a tour of all important Pacific Coast cities.

George J. Kirchgauer, of The Cutler-Hammer Manufacturing Company is receiving congratulations on the unique and helpful Electrical Directory of Milwaukee recently published by the Milwaukee Jovian League of which he is president. The directory has been published entirely at the expense of the local Jovian Chapter. There were no advertisements solicited nor accepted since such solicitation of advertisements for publications of this kind is considered harmful to advertising in general, and as a consequence no attempt to secure assistance or donations under the guise of advertising was made.

J. G. Pomeroy, of Los Angeles, has given up the agency for the Bryant Electric Company, the change to take effect July 1st. His new connections will be announced later.

Changes and Beginnings

The Pacific Electric Company, H. V. Reynolds, proprietor and J. E. Santerre, sales manager, has opened offices in Olympia, Washington. The company will carry a full line of electrical supplies; will also do electrical wiring, electrical repair work and work on the electrical equipment of autos.

The Enterprise Electric Works has leased the building to be erected at Mission street near Eighth, San Francisco. The new quarters will be two stories high and will cover a ground space of 50x165 feet.

The Pneuvac Company, of Worcester, Mass., manufacturers of electric vacuum sweepers, have recently established headquarters in the Furnisher Exchange building, 1055 Market street, San Francisco. F. W. Bibben is the Pacific Coast manager.

Water Shortage in California

April, 1918, was about normal in temperature in California, but the precipitation was considerably below normal. For the State as a whole, the average rainfall was 0.75 inch, which is but 44 per cent of the normal amount for April. In the southern half of the State but two stations received a total precipitation of one inch or over. More than the usual amount of sunshine was received. The wind movement was high, as is usual during spring months. While killing frosts were infrequent, frosts injurious to vegetation occurred on several days in the agricultural portions of the State. Frosts occurred at Red Bluff on two days, at Fresno on three days, at Sacramento on five days, and at San Jose on five days. Streams maintained normal stages during the month, and no destructive floods were reported. Little snow fell in the mountains, while the warm sunshine and desiccating winds caused much of that lying on the ground to disappear. At the close of the month the only snow on the ground in California was that in the high Sierras and that near the summits of the isolated peaks. While there was less snow on the ground at the end of April than is usual at that time of the year, there was every indication that there would be an ample supply of water for irrigation and power purposes during the coming summer, and that the threatened shortage would occur only in a few restricted regions.

California Railroad Commission Hearing on Power Shortage

Representatives of power companies in Central and Northern California and members of the California Railroad Commission took steps at a conference recently for immediate relief of the power shortage, caused by the light rains and by the increased demands for electric energy by war industries. They agreed:

1. That the utilities shall pool their power.
2. That the Commission shall prepare a priority list of consumers by which industries manufacturing articles not essential to the war shall be the last served.
3. That a representative committee shall work out a method of compensating some of the smaller power and power purchasing companies whose business is certain to be affected by the priority rules.

The priority regulations are yet to be worked out, but it was emphasized that railroads, ships, utilities and Army and Navy industries shall first be served. Other industries will be grouped under various classifications, those manufacturing war necessities to have the preference in being given power.

Mortimer Fleishhacker of the Great Western Power Company said that the drought threatened California's food production, and that unless the power companies were in a position to furnish sufficient electric energy for pumping for irrigation purposes, crops would be hard hit. To furnish this power, he said, some of the non-essential industries must make the sacrifice.

Chief Counsel C. P. Cutten of the Pacific Gas and Electric Company said that while he desired to co-operate with the Commission and his company desired to be in the pool, his company would object to reimbursing any of its smaller customers that might suffer because of the curtailment of power to non-essentials.

H. F. Jackson, general manager of the Sierra and San Francisco Power Company urged the Commission to look after relief for the shortage immediately and to lose no time in working out the financial problems that will follow.

D. M. Folsom of the Fuel Administration said oil had nothing to do with the power shortage, and that there would be no confusion between the oil priority list and the power priority list because a person barred from getting oil would not be permitted to get power generated from oil.

Ralph Merritt, Federal Food Administrator, said the Government would back the State and the utilities in enforcing the power priority list.

The Commission declined to have any of its members named on the committee to work out details of the priority list, on the ground that it might embarrass both the committee and the Commission. The utility representatives then met and named this committee: Samuel Kahn, Western States Gas and Electric Company; John A. Britton, Pacific Gas and Electric Company; Mortimer Fleishhacker, Great Western Power Company; H. F. Jackson, Sierra and San Francisco Power Company; Albert Caspar, Vallejo Electric Light and Power Company; S. W. Coleman, Coast Counties Gas and Electric Company, and Edward Whaley, Northern California Power Company.

L. S. Ready, of the engineering staff of the California Railroad Commission, was named by this committee as power director. His duties; the committee plans, shall be to see that the priority list is adhered to and to make such recommendations for interconnections between the various power companies as may appear feasible during the period of the war.

Finance Corporation Helps Utilities

The War Finance Corporation at Washington is displaying unusual energy in considering the needs of public utility corporations, according to the Financial World. At its first meeting the officials considered 62 applications for loans or for license to refund maturing obligations from utility corporations, and approved sixty of these as having merit, disapproving only two. The amount of loans considered totaled \$172,069,605 and the aggregate approved was \$166,069,605. Of this total \$125,860,284 was for refunding purposes, the aggregate of new issues being \$40,209,321. New issues last year for the same period totaled \$107,504,075, so it is apparent that public utility corporation directors and officials are quite alive to the necessity for curtailment whenever possible, and it is also of some significance that so many corporations feel confident that they can refund maturing obligations by the issuance of new securities, extending the maturing obligations for a certain period.

Practically all refinancing to be done will be put through on a higher interest basis, and the obligations given in exchange for the maturing notes or bonds will be for short maturities, from one to three years usually, and it is believed the improved position of public utilities as a whole, with larger income assured by reason of a revision of rates upward, will develop a renewed confidence in the public utility situation. It is interesting in this connection to compare the classes of new securities considered by the War Finance Corporation and approved or disapproved. The public utilities make by far the best showing. The figures follow:

	Municipal.	Utility.	Industrial.
Number considered.....	192	62	108
Number approved.....	140	60	77
Number disapproved.....	34	2	24
Number curtailed.....	18	0	5
Amount considered.....	\$86,878,512	\$172,069,605	\$219,510,296
Amount disapproved.....	19,791,665	6,000,000	39,900,000
Aggregate approved.....	69,086,847	166,069,605	179,610,299
Less refunding.....	21,392,312	125,860,284	111,411,900
Aggregate new issues.....	45,694,534	40,209,321	68,198,399
New issues last year same period.....	108,952,865	107,504,075	287,754,684

The policy to be pursued at Washington is that corporations must be able to earn fixed charges before being allowed any advances from the War Finance Corporation.

Trade at a Glance by Bradstreets

San Francisco

Wholesale and Jobbing Trade—Good.
Retail Trade—Fair.
Manufacturing and Industry—Very Active.
Collections—Fair.
Evidence of increased activity and speed in Government work, especially shipbuilding.

Seattle

Wholesale and Jobbing Trade—Good.
Retail Trade—Good.
Manufacturing and Industry—Active.
Collections—Fair.
Crops—Good.
Large increase in crop area.

Tacoma

Wholesale and Jobbing Trade—Good.
Retail Trade—Good.
Manufacturing and Industry—Very Active.
Collections—Good.
Rains and warmer weather beneficial to crops.
Shipbuilding facilities to be increased; housing and transportation of workers are problems now receiving attention; labor of all kinds in strong demand.

Portland

Wholesale and Retail Trade—Good.
Manufacturing and Industry—Active.
Collections—Fair.
Shipbuilding—Expanding.

Los Angeles

Wholesale lines somewhat improved.
Retail still reported slow.
Collections only fair.

A National Trade Mark

The National Trade Mark Bill now before Congress aims to prevent the situation now occasionally coming up where an American manufacturer is shut out of a foreign market owing to the fact that an unscrupulous foreign merchant has "pirated" his trade mark.

In the case of a trade mark, owned and protected by the Government, this American manufacturer could outwit

the pirate merchant by merely substituting the national trade mark for his private mark on all shipments to that country. The intention is not to make the use of such a trade mark compulsory. The mark should be granted, it is urged, only to the manufacturers of goods that reflect credit on the industries of the country.

The measure providing for a national trade mark is only one of a number now being put in shape and considered by the Department of Commerce with a view to preparing the American manufacturer and exporter to hold his own in the struggle for world trade that is expected to follow the making of peace.

California Water Commission Notes

The following applications for permission to appropriate water have been filed with the State Water Commission:

The Nevada-California Power Company of Riverside makes application for 12 second feet of Birch Creek in Inyo county for the generation of electric energy to be developed at existing power plants Nos. 2, 3, and 4, by falls of 913, 791 and 995 feet respectively, the horsepower to be developed being 1244, 1079 and 1356 theoretical horsepower, respectively. The estimated cost of the works is \$42,500.

The Southern Sierras Power Company of Riverside applies for 12 second feet of Birch Creek, when said water may be available for the generation of electric power at existing plants Nos. 5 and 6 of this company. It is proposed to develop 500 and 513 theoretical horsepower by falls of 366 and 230 feet, respectively. The estimated cost of the work is \$42,500.

The Waterford Irrigation District, by E. N. Bryan, chief engineer, applies for 150 cubic feet per second of waters of the Tuolumne river in Stanislaus county for the irrigation of 13,866 acres within the district. It is proposed to divert the water by means of a pumping plant, there being an upper canal $6\frac{1}{4}$ miles long and a lower main canal $9\frac{1}{2}$ miles in length. The plan is to use the pumps for a supplementary supply when there is a lack of water from the district's original appropriation at the La Grange Dam, above the point of diversion of the present application. The estimated cost of the works is \$175,000.

R. M. Birchell of Le Grand applies for 2000 gallons per minute of waters of Mariposa Creek in Merced county, by means of a centrifugal pump for irrigation purposes.

G. H. Canoles of Delevan applies for 12 second feet of Hunter's Creek in Colusa county for the irrigation of 513 acres of rice lands by means of an electric pumping plant.

Charles E. and Minnie Longton of Sacramento make application for 1 second foot of Empire Gulch, tributary to Black Creek in Calaveras county for power purposes, water to be returned to the stream after use.

Albert Fischkeller of San Francisco applies for $1\frac{1}{4}$ second feet of Palo Verde Lagoon in Imperial county for irrigation on forty acres, by means of a pumping plant.

Hastings Tract Company of San Francisco applies for 600 cubic feet per second of the waters of Lindsay Slough, tributary to the Sacramento river in Solano county, for the irrigation of 60,000 acres to be planted to rice and other crops. The water for the proposed project is to be diverted by means of electric pumping plant.

E. E. Lindsey of San Francisco applies for 30 cubic feet per second of the waters of Buck's Creek, tributary to the North Fork of the Feather River in Plumas county, for the generation of power for mining and manufacturing purposes.

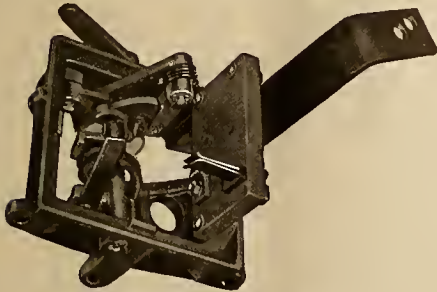
Charles T. Ross of San Francisco makes application for 20,000 acre feet of the waters of the South Fork and the Middle Fork of Cosumnes river in Amador and Eldorado counties, and a like amount of the waters of the South Fork of Dry Creek just below its junction with Dead Man's Creek, and also at Irish Hill, and 5000 acre feet at Sutter Creek, tributary to Dry Creek, in Amador county, said waters to be used for the irrigation of 30,000 acres.

LATEST IN EVERYTHING ELECTRICAL

(An automatic controller which makes it possible to maintain an even temperature for an indefinite period and a self-timing circuit breaker are two of the important new devices presented below. Among the interesting developments which are to be of great importance under later war conditions is the encouragement of new fields for the usefulness of the crippled or blind—as recorded here in the case of the taping of coils.—The Editor.)

AN ENCLOSED FLOAT SWITCH

Anyone familiar with installations of remote control pumps, such as pumps in the basements of buildings and tank pumps along railroad right of ways, knows that the pumps and motors receive very little attention, and the float switch still less when the motors are started and stopped by such a device. As long as the water gauge shows a good supply of water in the railway water tank the attendant will not trouble himself to know whether the float switch is covered with ice and dirt or whether



Operating mechanism of enclosed float switch

the operating mechanism of the switch can operate properly. Overflowing of water tanks are not uncommon occurrences. Realizing the lack of attention given to float switches and the severe conditions under which they must operate, the Cutler-Hammer Manufacturing Company, of Milwaukee, has developed an enclosed weatherproof float switch built so heavy it will stand lots of abuse and with an operating mechanism that will positively open and close with the rise and fall of the float. One of the chief objections to some switches is that they get out of step, if for any reason the switch fails to latch in. This happens through the contacts becoming badly burned which prevents the blade from entering the clips. Or where the blades become bent out of adjustment the same result follows. When the latching mechanism of such a switch gets out of step, the switch opens when it should close and vice versa. The design of the new C-H switches makes this impossible. The switch can only be open when the lever is in one position and only closed when in the opposite position.

A cast iron case provided with mounting ears carries all of the operating mechanism and terminals. A hole is tapped and bushed in the top of this case for the entrance of conduit. The arrangement permits removing the lower enclosure without disturbing the operating mechanism or connections. The new operating mechanism consists of a cam and roller. The arm carrying the roller is pinned to the main shaft which is turned by the outside cast iron lever. The cam is made of malleable iron and is cast integral with

the sleeve carrying the switch blades. This sleeve turns on the main shaft. When the main shaft is rotated, the roller is driven up the side of the cam tightening an elliptical spring. When the roller passes the point of the cam the tension of the spring either opens or closes the switch. This is the positive part of the mechanism as the switch will always be open when the roller is on one side of the cam and always closed when on the other side.

These switches are furnished complete with a sheet copper float having conical ends, float rod, and a heavy float rod guide. Conical end construction is used on the copper floats which gives a greater strength than flat ends and there is less chance of the float opening at the end seams. Various mounting and controlling arrangements are furnished. The single pole switches are intended for use in connection with a starter for controlling A. C. or D. C. Motors. The two, three or four-pole float switches are designed for single phase self starting and polyphase squirrel cage motors which may be thrown directly across the line to start. They can also be used for direct current motors when used with a suitable self starter. These multi-pole switches have a maximum capacity of 5 H. P. at 110 volts and 7½ H. P. at 220, 440, or 550 volts.

THE BLIND TAPING COILS

Last fall the question of securing some help from the blind was taken up by the Westinghouse Electric and Manufacturing Company with the Pennsylvania Association, a branch of which is located at Pittsburgh, and a sample lot of motor coils to be taped was sent to the Association in order that the employees might be given a chance to show



C-H enclosed float switch showing wall mounting and view with lower enclosure removed.



An Opportunity for the Blind

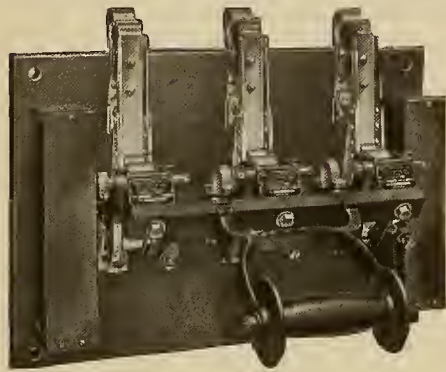
what they could do. When the coils were returned, it was very evident that this work could be done in an entirely satisfactory manner by those who have been deprived of their sight. Accordingly, arrangements were made with the management of the Association to allow some of their employees to do this work, payment to be made on a piece work basis.

As this was an entirely new line of work for them, it was decided to have a representative of the Association go to East Pittsburgh to become familiar with the work so as to instruct those assigned to do the work. The representative selected for this training was the wife of a former Westinghouse employe, who was deprived of his sight last summer, and who is now employed at the Association. She went to East Pittsburgh and was employed until such time as the management felt that she was sufficiently proficient in the taping of coils to teach the blind and inspect their work.

In order that they may not suffer any loss of revenue, while learning this new work, the Association is paying them the difference between what they earned at their former employment, and what their present production would entitle them to receive.

CIRCUIT BREAKER WITH TIMING ATTACHMENT

A self-timing circuit breaker for the protection of motors during starting or running is being manufactured by the Roller-Smith Company, 233 Broadway, New York City.



Barrier controlled by two independent methods

Interposed in the path of the trip armature is a pivoted hook-shaped barrier under two independent controls. One control is thermal and depends upon the expansion of an iron rod. This rod is heated at the same rate as the motor, which is being protected by the same cur-

rent that operates the motor. When the rod expands it retracts the barrier, causing the breaker armature to trip when the heating is excessive. It does not matter how this excess comes about—it may be either a prolonged starting current in the motor or a variable load with high requirements.

The other control, which is electro-magnetic, retracts the barrier instantaneously if a mechanically dangerous load is suddenly applied.

Both controls are adjustable for either the maximum current which may continuously flow or the emergency overload value. They may be adjusted independently if desirable. Ordinarily, however, the controls are set to protect the average motor of normal ampere rating, therefore no further adjustment is required.

UNIVERSAL HEATING PAD

The Universal Heating Pad manufactured by Landers, Frary & Clark, New Britain, Conn., has a number of unique features.

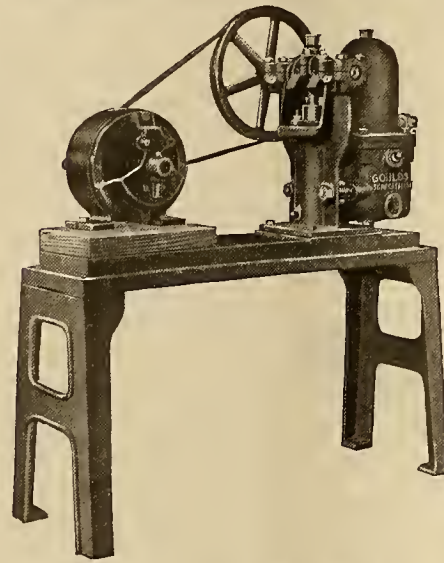
Chief among these is the spirally wound heating wire, permitting flexibility without danger of breaking. Temperature control is by permanently calibrated thermostats, selected by a simple one-piece lever switch. Guesswork and the hazard of overheating are eliminated.

Another important feature is the positions of the four thermostats. No matter how the pad is folded, no large fold can be made which does not include a thermostat. Hot spots and the resultant fires are done away with.

The cover is gray eiderdown and a washable slip is furnished. 10-foot cord is supplied with switch placed a convenient distance from the pad.

NEW ELECTRIC-DRIVEN PUMP FOR SMALL CAPACITY SERVICE

The Goulds Mfg. Co., Seneca Falls, N. Y., have recently developed a new pump for service in homes, summer cottages, camps, dairies, small hotels, etc. This pump is known



Pump for small capacity service

as the "Hi-Speed" and its predominating feature is its high speed of 500 R.P.M. which allows the pump to be belt-connected to the motor with only a small reduction and consequently with a small pump pulley instead of the large diameter pulley commonly used.

The pump is of the vertical reciprocating type and is suitable for pressures up to 43 pounds or 100 feet elevation. It

is made in two sizes, 1½-inch diameter with 1½-inch stroke and 2-inch diameter with 1½-inch stroke. The former has a capacity of 3 gallons and the latter a capacity of 6 gallons per minute.

All the gears have been eliminated in the pump to insure quiet operation. The outfit is self-oiling, the bearings being fitted with ring oilers, and the main bearings are fitted with renewable bronze bushings. The crank-shaft is counterbalanced to insure smooth operation at the high speed of the outfit.

The outfits are furnished complete with pump and removable legs, as desired.

The outfits are furnished with ¼ horsepower, 1750 r.p.m. Robbins & Myers motors.

AUTOMATIC ELECTRIC CONTROLLER

This controller is a small unassuming looking device, 2x2x5 inches, quite simple in mechanism, made by the Automatic Electric Controller Co., Seattle, Wash. It is attachable to all electric heating appliances used on lamp sockets. It stands in the same relation to them that the governor does to the steam engine, or the safety valve to the boiler.

To illustrate heat control and economy by using the A. E. Controller: Attach the controller to the cord of an electric iron, set the regulator to the degree of heat required and forget it—as one is apt to do with electric irons with dire results! The iron may stand for days, but will never grow hotter. The heat shuts off and comes on again automatically, and thus a steady temperature is maintained indefinitely. No pulling out the plug to cool, no waiting to heat, no fear in forgetting, and it cuts the lighting bill in half! This is the way it works with all appliances, besides saving your elements and lessening fire risk.

Another great advantage in using the A. E. Controller in applying electric heat to the body, is the ability to start, say, at blood heat and gradually increase the temperature until the desired maximum is reached. Then by adjusting the regulator the temperature remains uniform.

It is attachable to toasters and other cooking appliances, to incubators, floor mats, vulcanizers, or wherever a uniform temperature must be maintained. But nowhere is its economy, efficiency and safety more appreciable and necessary than in application of electric heat to the body by means of pads, blankets, face masks, mats, etc.

BOOKS AND BULLETINS

New Catalogue

Appleton Electric Company, 218-30 N. Jefferson street, Chicago, Illinois, announce their new 160 page catalogue covering the complete line of "Unilets" and other conduit fittings which they manufacture. This catalogue is furnished in two sizes, viz., standard electrical manufacturers size, 8 x 10½ inches, and also in convenient pocket size, 4 x 5¼ inches. The catalogue contains numerous new fittings recently placed on the market by this company and a feature of the catalogue is the pictorial index which makes it practically easy for the workman to select fittings required for the installation. Catalogue in either size sent upon request.

Upbuilding of the Industry

"The New Traction Problem" is discussed in a recent pamphlet by Theodore P. Shonts, president of the Interborough Rapid Transit Company of New York.

An extremely interesting 125-page circular (No. 75) on Safety for the Household has been recently issued by the Bureau of Standards. The purpose as stated is (1) to emphasize the seriousness of certain risks frequently occurring in or about the home, (2) to give simple methods of care and caution to protect life and property from such hazards, and (3) to stimulate interest in public measures to provide safety for the household and the community. Some 35 pages of the bulletin are devoted to electrical hazards and household practice in regard to them.

The fourth annual report of the Public Utilities Commission of the State of Idaho for the year 1916-1917 is available for distribution. The booklet gives a brief resume of all cases appearing before the commission and discusses the Idaho situation from the public utility's standpoint.

Electrical Apparatus

Bulletins Nos. 183, 184 and 185, recently issued by the Crocker-Wheeler Company, cover the subjects of "Motor Drive for Printing Machinery," Direct Current Lighting and Power Generators" of direct connected and engine types and "Coupled and Belt Types of Alternating Current Generators." These catalogues are from 4 to 8 pages in length and perforated for loose leaf binding.

A 30-page bulletin on Direct Current Standard Unit Panels for general power and lighting service has been recently issued by the General Electric Company under the number 47070.

A well illustrated, 8-page bulletin issued by the Ward-Leonard Company covers the subject of the "Method of Determining the Size of a Battery Charging Rheostat."

A bulletin on Miniature Direct Current Instruments has recently been sent out by the General Electric Company, designed especially for users of small panels, automobile starting sets, electric vehicles and generally for small direct current installations.

A universal charging rheostat for the charging of starting, lighting and ignition batteries is advertised in an envelope folder gotten out by the Ward-Leonard Electric Company of Mount Vernon, N. Y.

A light weight substantially built Hand Magnet which has become extensively used by smelters and refiners, metal dealers, iron and brass foundries, machinists and others is illustrated and described in a new leaflet (publication No. 250) just issued by The Cutler-Hammer Company of Milwaukee, Wis. This hand magnet weighs 8 pounds and has a cast aluminum covering, is operated with a simple trigger and is very useful in separating iron or steel from copper, brass, antimony, tin, and other non-magnetic substances.

"Electrical Equipment for Cement Mills" is the title of the special publication (or circular No. 7174) just issued by the Westinghouse Electric & Manufacturing Company. The

pamphlet has an attractive art cover, illustrating the interior of a motor driven cement mill, while numerous photographic reproductions are given throughout the publication showing the application of motors to various types of machinery employed in cement mills. Advantages of motor drive for this class of service, and characteristics required by motors to be specially successful, are given briefly.

Appliances and Supplies

A price and data book on Small Circuit Breakers has recently been issued by Ray D. Lillibridge, Inc., for their client the Ward-Leonard Electric Company at Mount Vernon, N. Y.

A series of attractive pamphlets and folders was issued by the G-E division of the Edison Electric Appliance Company in conjunction with their "Iron Sales Week" which was devoted to the pushing of iron sales throughout the country.

Westinghouse fans form the subject matter for an attractive folder sent out to dealers with a showing of cuts available for retail advertising.

The announcement of a Hotpoint Advertisement which is to appear nationally on June 29th is made to the trade through an attractively illustrated folder containing a facsimile of the advertisement.

"Eye Comfort," a most attractive folder recently published by the National X-Ray Reflector Company, contains loose leaf circulars of various types of illumination.

A catalogue and price list of Hotpoint electrical appliances is furnished to dealers by the Hotpoint Division of the Edison Electric Appliance Company.

P. & S. Pull Canopy Fixture Switches are the subject matter of bulletin 52-A issued by Pass & Seymour.

A recent V.V. Fittings catalogue attractively gotten up with a picture of shipyard construction on the cover lists their complete line of marine fittings.

A new folder (publication No. 235) has recently been issued by The Cutler-Hammer Manufacturing Company of Milwaukee and New York which illustrates and describes C-H Electric Industrial Stoves for laboratories, printing and publishing plants, celluloid, hat and shoe factories, test rooms, and industrial service in general. The stoves are made in two types; one has a rectangular heating surface, and the other a disc or circular surface. The heating units are electrically welded to the working surface. The folder describes other details of construction and gives sizes, wattage and other data.

A Bibliography of Municipal Utility Regulation and Municipal Ownership

by Don Lorenzo Stevens of Harvard University; size, 6 x 9 in.; 410 pages; published by the Harvard University Press, Cambridge, Mass., and for sale by the Technical Book Shop, San Francisco. Price \$4.00.

The need for a comprehensive and intelligent bibliography on business subjects has long been felt by librarians and busy readers—and in the case of the one subject of municipal utilities this need has now been met. The work covers writings on the subjects of the History of Utilities and Regulation, Franchises, Public Service Commissions, Valuation, Rates, Taxation, Holding Company and Municipal Ownership, and is intended for public service company managers, commissioners, lawyers and others interested in public utilities.

The list is very complete and covers thoroughly all recent works in English on these subjects down to 1917, and the best of the earlier ones. The general fields of electricity, gas, water and traction utilities are included and wherever possible a short descriptive note on the book is appended.

Aside from the fact that no such bibliography can be brought down to date, and that any book of this nature is in some measure out of date at the time it is published, the work is one which will prove of great value to utility men.

NEW ELECTRICAL DEVELOPMENTS

(Considerable activity is reported in the extension and enlargement of power plants and transmission lines in the Northwest. In the Central and Southwestern districts, interest centers in proposed improvements in lighting districts or new installations. The increase in ship building and establishment of shipyards promises an increased load from this source. A new transmission line to Ely and the electrification of several of the larger mining properties mark the two weeks period in the Inter-mountain district.—The Editor.)

THE PACIFIC NORTHWEST

WILSONVILLE, ORE.—The electric light plant of N. W. Young has been sold to the Molalla Electric Company.

NEW WESTMINSTER, B. C.—The Timberland Lumber Company is erecting a saw mill on the Fraser river, to cost about \$100,000.

BREMERTON, WASH.—The Senate has increased the amount of \$200,000 for power house here provided by the House to \$325,000.

SALEM, ORE.—Bids are being received for the installation of the electric lighting system on the Salem bridge over the Willamette river.

NEW WESTMINSTER, B. C.—Improvements and extensions involving an expenditure of about \$5,000 are contemplated to the municipal electric light plant.

SEATTLE, WASH.—Puget Sound Traction Light & Power Company is to construct a reinforced concrete smoke stack at its Georgetown plant, 235 feet high and to cost \$15,000.

SEATTLE, WASH.—NePage McKenny Company, electrical engineers and contractors, Armour building, will make extensive additions to their plant. The capital of the concern will be made \$60,000.

WATERVILLE, WASH.—Application has been made to the Douglas County Commissioners by the Chelan Falls Power Company for permission to construct and maintain an electric transmission line in Douglas County.

OLYMPIA, WASH.—George W. Dilling of Seattle has made application to the state hydraulic engineer for 11,000 second feet of water from the Skagit river for the development of 40,000 horsepower. The estimated cost is \$2,000,000.

LOON LAKE, WASH.—Plans have been prepared for the construction of a 100-ton concentration mill at the plant of the Loon Lake Copper Company, to cost about \$40,000. The plans provide for the installation of considerable electrical machinery.

SEATTLE, WASH.—An ordinance has been introduced in the city council authorizing the Board of Public Works to prepare specifications and advertise for six one-man single truck steel cars and 20 double truck steel cars for the municipal railway which is now under construction.

SEATTLE, WASH.—Plans are being prepared by Daniel Huntington, city architect, for the addition of another floor to the municipal auxiliary steam-driven electric plant at Eastlake Avenue and Nelson Place. The additional space is to be utilized as an electrical testing laboratory.

EVERETT, WASH.—Although the plan of the city to launch a movement for municipally owned and controlled light and power plant is about ready to be placed before the voters, it is thought that the council will forego any action of this kind until after the close of the world war.

PORTLAND, ORE.—The next step for the construction of the proposed hydro-electric plant by the Big Bend Transit Company will be the purchase of the overflow lands on the south side of the river. The Big Bend Transit Company is a corporation and proposes the construction of an electric line from this city down the Spokane river to its junction with the Columbia at Miles. William A. Nicholls of Spokane is president of the company.

SEATTLE, WASH.—The Standard Underground Cable Company was awarded the contract for furnishing the city with 70,000 pounds of copper wire at \$19,636.

REEDSPORT, ORE.—Preliminary plans are being prepared by the Umpqua Light & Power Company for the construction of a new electric transmission line across the Umpqua River at Reedsport. The Umpqua company recently took over the property of the Gardiner (Ore.) Light & Power Company.

SPOKANE, WASH.—The Westinghouse Electric and Manufacturing Company of Pittsburgh, Pa., it is reported, has acquired the controlling interest in the Spokane Heat, Light & Power Company, which operates a central heating, lighting and power plant, furnishing service to the central district of Spokane.

CHEHALIS, WASH.—Chehalis may be forced to have another election to pass on the franchise sought by O. E. Anderson and associates for another light and power company. It is declared by a petition asking for a re-submission to the voters and presented to the city fathers that the recent franchise election was illegal.

SEATTLE, WASH.—The plant of the Vulcan Manufacturing Company has been purchased by the Frank Waterhouse Company, which proposes to expend several hundred thousand dollars to enlarge the property. Main engine castings, heavy overhead traveling cranes, cargo winches, shaftings, etc. are manufactured in the plant.

EUGENE, ORE.—The automobile association has appealed to the city council for lights to be installed in the auto camping park, north of Skinners Butte. The matter had been taken up with the water board, who referred same to the city council. This body referred it to the water and light committee, with power to act.

PORTLAND, ORE.—Preparations, it is reported, are being made by the Pacific Power & Light Company for the erection of a 6600-volt, three-phase transmission line to supply service to two beet-sugar factories of the Utah-Idaho Sugar Company. The company is also planning to build a new outdoor substation near Kahlutus.

SOUTH BEND, WASH.—The Willapa Power Company has been given the right to condemn property for its big dam so that it will be possible to supply the city with water. It gives the home company control of the supply of water on the South Fork so that South Bend can have its own water works when the present franchise expires.

VANCOUVER, B. C.—The Jarvis Electric Company of Vancouver has been awarded the contract for electrical machinery to be installed on the three auxiliary sailing ships under construction by the William Lyall Shipbuilding Company, including three generators, directly connected to gas-line engines, electrically driven sail hoists and motor equipment for air-compressors and bilge pumps.

VANCOUVER, B. C.—Sealed proposals will be received by the Columbia River Interstate Bridge Commission June 28, 1918 at 11 a.m. at the court house here for furnishing all materials and covering all work necessary in the erection of a transformer house to be located in this city. Certified check for ten per cent of the bid payable to Rufus C. Holman, chairman, is desired with bid.

PORTLAND, ORE.—The Liberty Foundry, Inc., recently incorporated, has leased the plant of the Lister Sash Weight Company, which it proposes to equip for a foundry and machine shop. The company contemplates adding electric welding and brass and bronze casting departments. William Cornfoot, shipbuilder, is among the incorporators.

HANFORD, WASH.—Application has been filed at the land office by the Blackrock Power & Irrigation Company asking for an easement for the erection of a high-tension electric transmission line from Hanford to Priest Rapids, a distance of 35 miles. The company, it is assumed, contemplates irrigating a large tract of land lying above the proposed high line canal.

SEATTLE, WASH.—Sealed bids will be received by the Board of Public Works up to 10 a.m. Friday, June 21, 1918 in room No. 234 County-City building, for furnishing one 1000 kilowatt motor generator set for the city light department in accordance with specifications approved by the board on May 31st, 1918 and now on file and ready for distribution in room No. 234 County-City building. Amount of bond successful bidder will be required to furnish will be equal to 100 per cent.

OLYMPIA, WASH.—Sealed bids will be received by the State Board of Control, Olympia, Wash., until 11 a.m. Monday, June 24, 1918, for cottage and power house at state school for girls, Grand Mound, Wash. Bids are to be in sealed envelope addressed to the Secretary of the State Board of Control and to be let in separate contracts as follows: General contract, heating and central power plant, plumbing contract, wiring and installation of generator set. Each bid must be accompanied by a certified check in the sum of five per cent of the bid price payable to the secretary of the State Board of Control.

TACOMA, WASH.—The City Lighting Department is considering a contract with the Tacoma Railway & Power Company, under which the company will install, maintain and operate the large generator which the city has purchased and for which no space has been provided. The Tacoma company has offered for \$1,800 per year to install and operate the generator and hook it up with its own switchboard, so that if the peak load were exceeded the company could cut in the city line on its own current. Hamilton Gronen, commissioner of light, estimates that it would cost the city \$10,000 to build a substation on the tide-flats and \$4,500 for salaries to operate the plant.

SALEM, ORE.—The applications of the Portland Railway, Light & Power Company, one for permit to construct the Timothy Meadow reservoir on Oak Creek in Clackamas county, and the other for permit to appropriate 667 second feet of stored waters together with waters of Clackamas river have been approved by State Engineer Lewis. In the Timothy Meadow it is proposed to store 40,000 acre feet of water. The project involves the construction of a dam 80 feet high and 442 feet long and will cost about \$300,000. In connection with the permit for the appropriation of 667 second feet of water, it is proposed to develop 10,000 horsepower at a cost of about \$1,250,000. The filings of the company were made to renew rights which the company obtained several years ago. Under the law construction work on these projects must be commenced within one year and be completed within five years.

THE PACIFIC CENTRAL DISTRICT

BOLINAS, CAL.—The Chetco Mining Company is contemplating the installation of electrically driven pumping equipment at its local properties.

SAN JOSE, CAL.—The petition of Giles Bradley and others asking to erect and maintain a telephone line to connect Morgan Hill and Uvas was granted.

SAN FRANCISCO, CAL.—J. M. Dougan of this city has been awarded the contract for the erection of a \$200,000,

six-story building for the Pacific Telephone and Telegraph Company in Oakland.

SAN FRANCISCO.—G. H. Canoles of Delevan has applied for 12 second feet of Hunter's Creek in Colusa county for the irrigation of 513 acres of rice land by means of an electric pumping plant.

VISALIA, CAL.—C. D. Bahler of the Visalia Battery Company has taken a partner, extended the business and changed the name. The business will henceforth be known as the Bahler & Brady Electric Company.

SAN FRANCISCO, CAL.—The Board of Public Works has awarded a contract to the General Electric Company at \$39,162 for furnishing and delivering to the Hetch Hetchy site locomotives of the electric storage type.

COLUSA, CAL.—At the next meeting of the County Supervisors the petition asking the formation of the Colusa County Irrigation District will be considered. The State Engineer has reported favorably on the proposed project.

MODESTO, CAL.—Plans are being considered by the Sierra & San Francisco Power Company for extensive improvements, including the construction of a hydro-electric power plant on the Middle Fork of the Stanislaus river.

BERKELEY, CAL.—The contract awarded the Pacific Fire Extinguisher Company by the City Council for street lighting has been declared void by the District Court of Appeals in the district embraced by Derby, Warren and Garber streets.

ANGEL'S CAMP, CAL.—The Pioneer mine will sink the shaft, now 135 feet in depth, to the full depth of 600 feet. A station will be cut at a depth of 300 feet and another at the 600-foot depth. Electric power will be installed to operate the machinery.

SAN FRANCISCO, CAL.—In preparation for the sale of the second unit of Oak Knoll Manor, Lavelle & Holt have closed a contract for the installation of a water system and electric light service on both the second and third units of their home park.

ALTURAS, CAL.—The Long Valley Irrigation District with headquarters at Doyle, Lassen county, was endorsed by the executive board of the Northern California Counties Association in session here. The association will ask federal aid for the development of the project.

WILLOWS, CAL.—Bonds of \$175,000 with which to finance construction of the proposed Princeton-Codora-Glenn Irrigation District have been voted. The funds will provide for the acquisition of a portion of the canal and laterals constructed by the Sacramento Valley Irrigation Company.

SACRAMENTO, CAL.—An increase of three to five cents an hour in the pay of 175 motormen and conductors employed on the local street car system operated by the Pacific Gas and Electric Company was announced by representatives of the company. It was to become effective immediately.

TRACY, CAL.—The directors of the West Side Irrigation District, John C. Chrisman, secretary, have awarded a contract to the Electric Machine and Equipment Company, 124 N. El Dodaro street, Stockton, at \$2,939.90 for the construction of telephone lines in the district. The only other bidder was C. H. Laiblin of Manteca.

REDWOOD CITY, CAL.—The Board of Supervisors have ordered that an election be held on June 11th in the proposed "San Carlos Highway Lighting District of San Mateo County," at which time will be submitted the question of whether or not the territory in the proposed lighting district shall be organized and formed into a highway lighting district.

TRACY, CAL.—The second issue of bonds of the West Side Irrigation District amounting to \$100,000 will be sold July 2. There is a growing demand for the extension of irrigation on the West Side and there are several schemes afloat for the inclusion of land in this district and for the

formation of new districts, to take in land east and south of Tracy.

SAN FRANCISCO, CAL.—A half million dollar order for vacuum valves, auxiliary wireless apparatus, has been placed with the Moorhead Laboratories by the British government. This apparatus will increase the range of British wireless stations from 100 to 800 per cent. A factory is under construction at 648 Mission street. Three shifts of 10 persons each will be employed.

SAN FRANCISCO, CAL.—Plans of the Bethlehem Steel Company for the construction of a large steel ship repair plant at Hunter's Point, San Francisco, have been accepted by the United States Government. The work includes the erection of machine shops, fabricating plants, marine railroad and other equipment. Three floating docks with a capacity of 8000, 4000 and 3800 tons, respectively, are to be moved to the new location, and two additional docks built. The cost of the entire project is estimated at \$2,000,000.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—The Board of Public Service Commissioners is inviting bids for 33,000 volt oil switches.

LOMPOC, CAL.—It is stated that the Lompoc Light & Power Company plans to spend between \$5000 and \$10,000 in improving the plant and distributing system in Lompoc.

SANTA ANA, CAL.—Plans have been filed by Kaufman & Sons of Santa Ana for the erection of a new factory at 1625 East First street. The company manufactures spot lamps.

PORTALES, N. M.—The city council has called a bond election for \$20,000 for repair and extension of city water, sewer and electric utilities. The election will be held on June 1st.

KINGMAN, ARIZ.—Preparations are being made by the Schuylkill Mining Company for the installation of a power plant to furnish power for its proposed 200-ton milling plant, now under construction.

SAN DIEGO, CAL.—The city council has passed a resolution that steps will be taken to light Sixth street and Park Boulevard in the near future, and that property owners should install and pay for the lights.

SANTA BARBARA, CAL.—The city council has adopted a resolution granting the Santa Barbara Telephone Company the right to erect and maintain appliances and conductors for certain thoroughfares of the city.

HOLTVILLE, CAL.—The Board of Supervisors have given the Winterhaven Improvement Company the privilege of laying the water and gas mains and installing a system for conducting electricity for Winterhaven and vicinity.

BAKERSFIELD, CAL.—The Willard service station, under the new management of O. Davidson, is making extensive changes in their place of business. The electrical department is being remodeled and equipped with everything electrical.

LONG BEACH, CAL.—Condemnation proceedings for streets in the harbor district, making possible other improvements necessary to local industries, will be started soon. The streets will be paved, lights installed, also sewers and water mains laid.

LOS ANGELES, CAL.—The Pacific Electric Railway Company has been ordered by the city council to remove its center poles and replace them with span poles to carry its trolley wire between Reservoir and Effie streets, on its Glendale-Edendale line.

SANTA BARBARA, CAL.—The city council has authorized the installation of ornamental light posts and fixtures on Chapala street from Ocean Boulevard to Gutierrez street, together with all the appurtenances necessary for construction, completion and operation.

NOGALES, ARIZ.—The Arizona Gas & Electric Company of Nogales has petitioned the State Corporation Commission for permission to issue \$100,000 in bonds, the proceeds to be used to pay for outstanding indebtedness and for an additional generating unit, to cost \$30,000.

ORANGE, CAL.—The board of trustees have adopted plans for the installation of an ornamental lighting system on Chapman avenue and Glassell street and the Plaza Square, consisting of 104 ornamental, reinforced concrete electric lighting posts, together with all necessary conduits, globes, foundations and other appurtenances.

LOS ANGELES, CAL.—The city has authorized the quit-claiming to the Standard Oil Company of a portion of the right-of-way to construct, maintain and operate lines of poles and wires for transmission of electrical energy, or telegraphic messages heretofore granted to the city by the Standard Oil Company and not now needed by the city.

BAKERSFIELD, CAL.—The Kern county board of supervisors have accepted the assessment of the Poso irrigation district of some 37,000 acres at the figures submitted by Harry W. McCray of \$305,000, and this will be paid in against the indebtedness of \$407,000 which is owing to the holders of the bonds, issued in 1888 when the district was organized.

REDLANDS, CAL.—The Pacific Electric will build an extension to Yucaipa just as soon as it is possible and consistent to build it, according to Paul Shoup, president of the railway, in a conference with business men of Redland. The matter of through service from Redlands to Los Angeles and from Los Angeles to Redlands must also wait until after the war, it is stated.

SAN PEDRO, CAL.—Terminal Island will not get the proposed gas mains and service on the line which will be laid off Fish Harbor, as a result of action of engineers and officials of the Southern Counties Gas Company. A route has been selected from the foot of Tenth street and across the channel. The gas company has applied to United States engineers for permit to lay a 3-inch main across the channel.

THE INTER-MOUNTAIN DISTRICT

ELY, NEVADA.—Plans are being considered by the Nevada-California Power Company of Riverside, Cal., for the erection of a high-tension transmission line to Ely, Nev., to cost about \$300,000.

COPPERFIELD, NEV.—The Washoe Copper Company of Copperfield is contemplating the erection of a forge shop, engine plant and compressor works at its new plant near the Nixon-Nevada property.

BONNERS FERRY, IDAHO.—The property of the Bonner Water & Light Company has been offered to the city for \$80,000. The first offer made through a bonding house several weeks ago was for \$125,000.

PROVO, UTAH.—Articles of incorporation of the Palmyra Telephone and Electric Light Company have been filed. The corporation will operate telephone, electric light and power lines. The principal place of business is Spanish Fork.

SANDPOINT, IDAHO.—The Falls Creek Mining Company is contemplating the installation of a power plant to furnish power for its proposed mill and compressor. The plans provide for the construction of a penstock 900 feet long, providing for a fall of 260 feet.

HARLOWTON, MONT.—Work has begun on the installation of electrically driven machinery throughout the entire plant of the Montana Flour Mills Company, to replace steam power. Electricity to operate the mill will be furnished by the Montana Power Company.

GOLDFIELD, NEV.—The Red Hills Florence has taken a long lease on several claims of the Florence Goldfield group. Leases have also been taken on adjacent claims of the Goldfield Consolidated. Arrangements have been made for the building of an electric power line to Gold Mountain, and for the establishment of a camp.

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